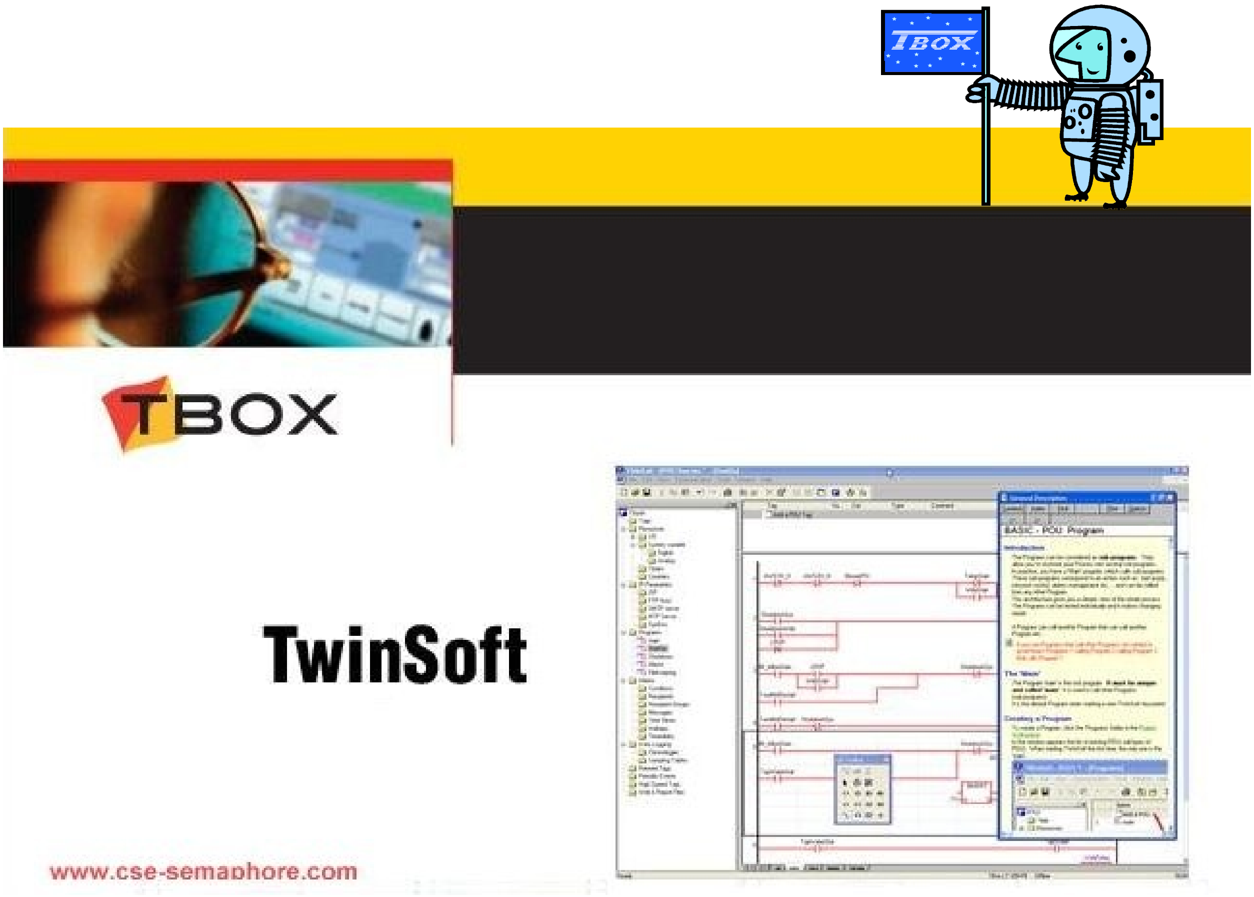
SEMAPHORE
TBOX

TBOX MS



TWinSoft User's Guide

Version 2.07

Certifications

Disclaimer
Every effort has been made to ensure the accuracy of the information in this guide. However, SEMAPHORE assumes no responsibility for the accuracy of the information. Product information is subject to change without notice.

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Internet Explorer is a trademark of Microsoft Corp.

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Edition: May 8, 2009
TWinSoft version: 10.04
Author: Jean Burton

Important Safety Instructions

Read and understand all instructions. Save these instructions.

- Read the instruction manual carefully before using the equipment and comply with the instructions that it contains to avoid mistakes and to prevent any personal injury or damage to property.
- **Warning !** It is mandatory that this equipment is earthed by the rack. Connect the crimp terminal ring to the earth with a stranded wire between 1.5 and 2.5 mm² inclusively. The cable must be crimped consistent with rules of good practice. Connecting only the earth on the power connector is not permitted.
- Installation must be carried out by suitable, competent personnel, according to the steps and stated specifications described in this manual.
- Use only the approved color-coded wires for connecting to mains. The green/yellow colored wire can be only used as earth wire.
- This equipment has been designed for use only by qualified and instructed personnel in an industrial environment. This equipment must be operated in a restricted access location according to IEC60950.
- It is a Safety Class I equipment (according to IEC classification) if powered by the MS-PS230V or a safety Class III equipment otherwise. In this case the equipment must be powered by a Safety Extra Low Voltage (SELV).
- If voltage under 60Vdc are used they must be Safety Extra Low Voltage (SELV).
- This Equipment has been designed to be also compatible with an IT power distribution system.
- This equipment has been designed to meet IEC60950-1 requirements (safety of information technology equipment)
- This equipment has been designed for indoor use in a Pollution Degree 2 environment (dry non-conductive pollution).
- The card must be fastened to the rack using a screw driver, with a recommended minimum torque of 0.5 Nm.
- **Caution** – Never power the card when not fixed on the rack. Switch off and disconnect power before removing the card from the rack.
- Connection from the equipment to mains must be protected by a circuit breaker of 16 A on both line and neutral except for TT or TN power networks with earthed Neutral unequivocally identified where only the Line need to be protected.
- **Caution** – To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.
- Do not use your TBox in a wet environment.
- Using this instrument in a way not specified by these instructions can impair the equipment safety. Do not operate the instrument outside its rated supply voltage and environmental ranges.
- Do not open power supply unit. There are no user serviceable parts inside.
- Do not connect or disconnect any connector when powered.
- Protect your TBox from environmental hazards such as dirt, dust, food, liquids, excessive temperature, and sunlight overexposure. The protection Rating of TBox is IP30.
- Keep your TBox away from direct or excessive moisture or rain and extremely hot or cold temperatures to ensure that the TBox is used within the specified operating range.
- Make sure that only fuses with the required rated current and of the specified type are used for replacement.
- End assembler must take appropriate precautions if the equipment is mounted on a wall to ensure the equipment is safely mounted in order to prevent the risk of detachment.
- End assembler must take appropriate precautions in order to prevent risks of electrical shocks if plugs to be connected to MS-RELAY, MS-8DI-120V or MS-8DI-240VAC are erroneously plugged to connector of another kind of card (like MS-8AI-420).
- **Caution** – Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the local regulations.

TABLE OF CONTENTS

PRESENTATION

Welcome to the World of TBox MS

The unique 'all in one' ***TBox MS*** includes the best of 3 Worlds:

Telemetry

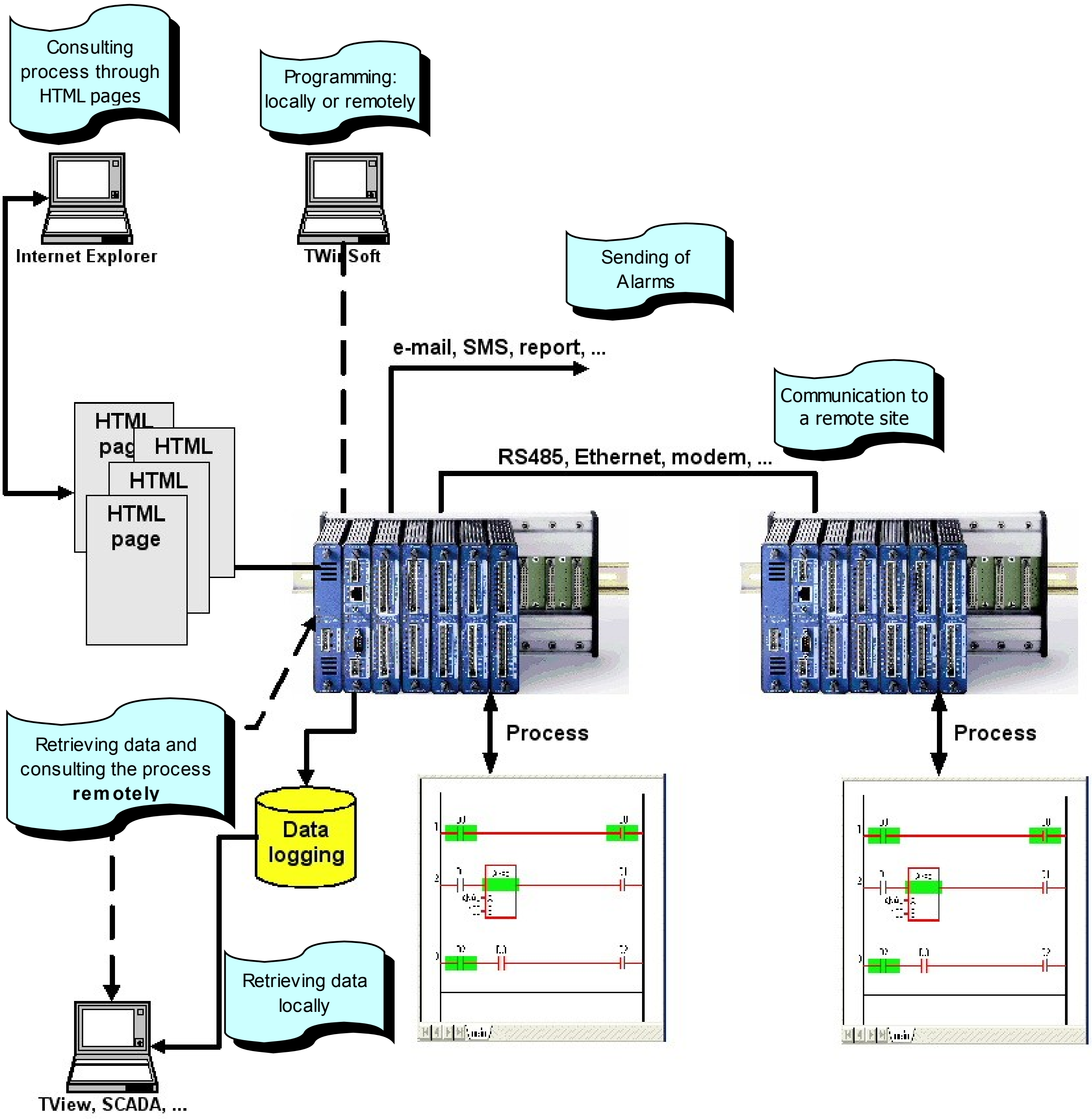
+

Internet

+

Automation

Overview of *TBox MS* possibilities



Consulting process through HTML pages
Programming: locally or remotely
Internet Explorer
TWinSoft
Sending of Alarms
e-mail, SMS, report, ...
Communication to a remote site
RS485, Ethernet, modem, ...
HTML page
HTML
HTML
HTML page
Process
Process
Retrieving data and consulting the process remotely
Data logging
Retrieving data locally
TView, SCADA, ...

1. How to use this manual?

1.1. What is in the manual?

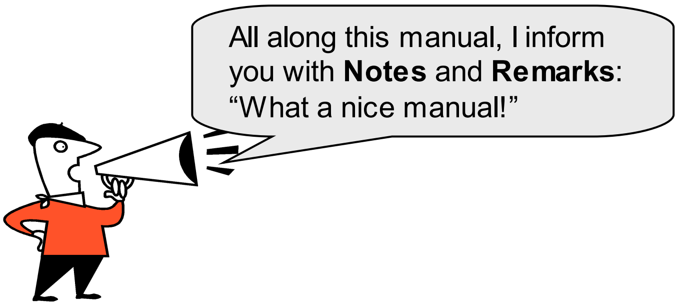
This manual constitutes the **essential** of ***TBox MS*** documentation.
The **'On line' help of TWinSoft** will guide you more precisely again in each configuration.

This manual first introduces to the **hardware concept** including nice pictures … ☺

Then it brings you to the programming of ***TBox MS*** using **TWinSoft**. All features are explained using plenty of snapshots for an **easy understanding** …☺

➢ Installation of TWinSoft:	chapter 3
➢ Starting TWinSoft:	chapter 4
➢ Properties of ***TBox MS***:	chapter 6
➢ Adding a card:	chapter 7
➢ Tags:	chapter 8
➢ IP configuration:	chapter 9
➢ Alarms:	chapter 10
➢ ReadSMS:	chapter 11
➢ Datalogging:	chapter 12
➢ Remote Tags:	chapter 13
➢ Periodic events:	chapter 14

Information related to **Licenses** is given in Appendix A.


All along this manual, I inform you with **Notes** and **Remarks**: "What a nice manual!"

1.2. What is not in the manual?

Rack and Cards installation, **technical specifications and cabling** of the cards are described in another manual: ***TBox-MS – Technical Specifications & Cabling***.

One major topic you will not find in this manual concerns the programming of Process.
TBox MS supports BASIC and Ladder languages for developing any advanced process.
Those languages are detailed in another manual: ***BASIC and LADDER for TBOX***

Another important feature, which is not presented into this manual, concerns the development of **HTML pages**, to use ***TBox MS*** as web server.
This matter is explained in details in another manual: ***WEBFORM STUDIO – Getting Started***

Another software part of the TWinSoft Suite is **Report Studio**, for creating e-mail report or files to send. It is explained in the 'On line' help of Report Studio.

2. The Hardware Concept

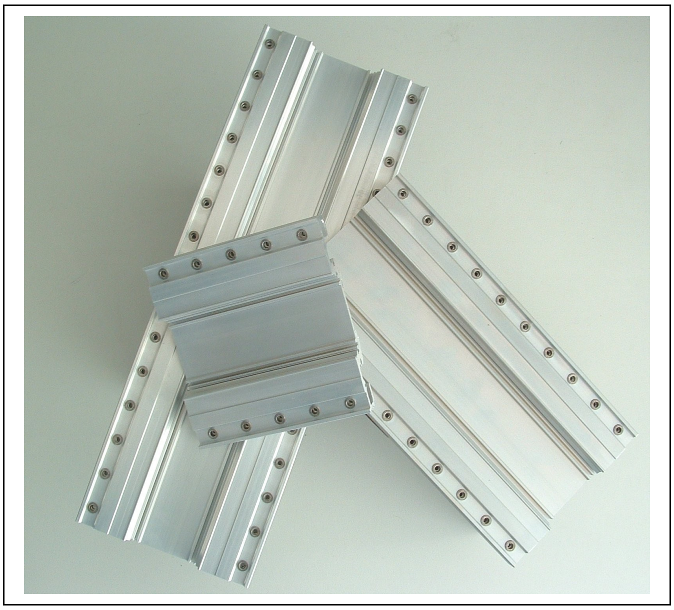
TBox MS is a **Modular System**.

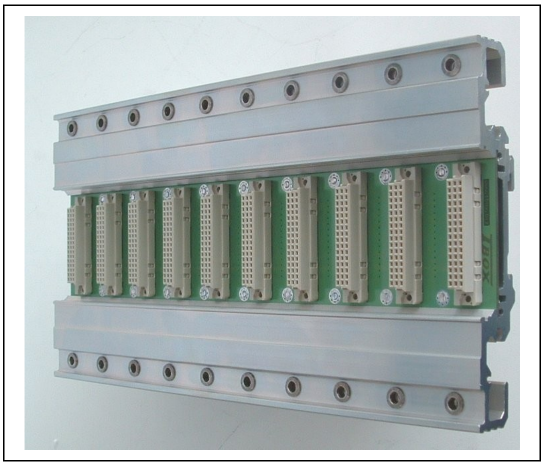
A RTU *TBox MS* is built up using **Racks** and **Cards**.

Depending on your needs in communication(s) and in Inputs/Outputs, you select the cards required.

2.1. The Racks

Racks are made in **aluminium alodined**, giving a very good electrical conductivity and **equipotentiality**





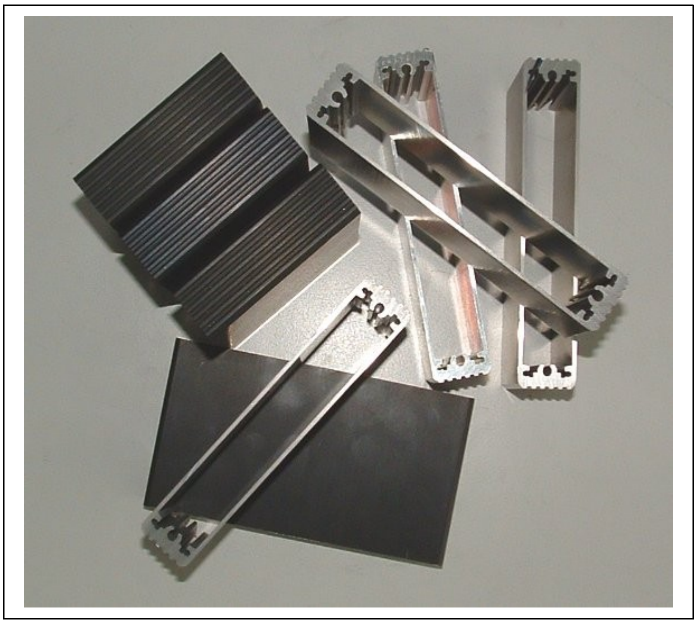
There are **4 models** of Racks:

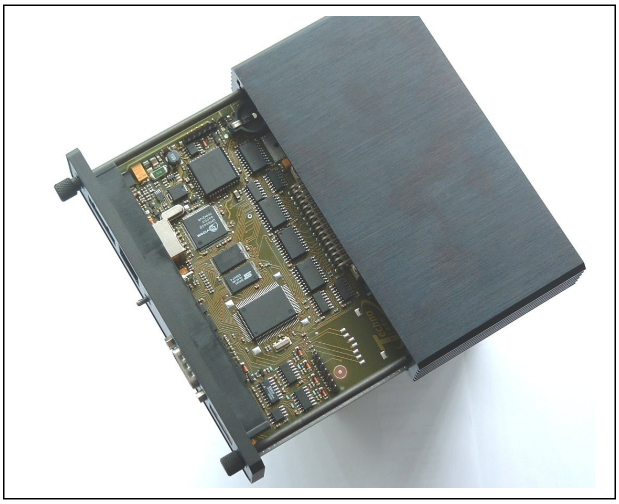
- 5 slots
- 10 slots
- 15 slots
- 20 slots

2.2. The Cards

Cards are formed of a PCB mounted in **aluminium enclosure** which assures the best **shielding** against receiving and emitting noise (radio emission, electromagnetic interference, …)

Bare aluminium inside the enclosure and on the edges assures a **good contact** for the 'ground' signal of the PCB between the Card and the Rack.





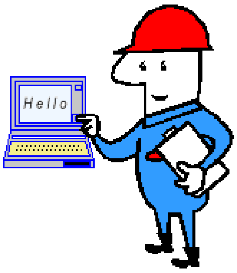
There are several Card models:

- Power supply
- CPU
- Communication ports
  - Modem
  - RS232/RS485
  - Ethernet
  - …
- Input/output
  - Digital inputs, outputs
  - Analog input 14 bits
  - Analog outputs 12 bits
  - Combination of digital/analog I/O
  - …

TWinSoft - Getting Started

3. Installation of TWinSoft

3.1. System requirements

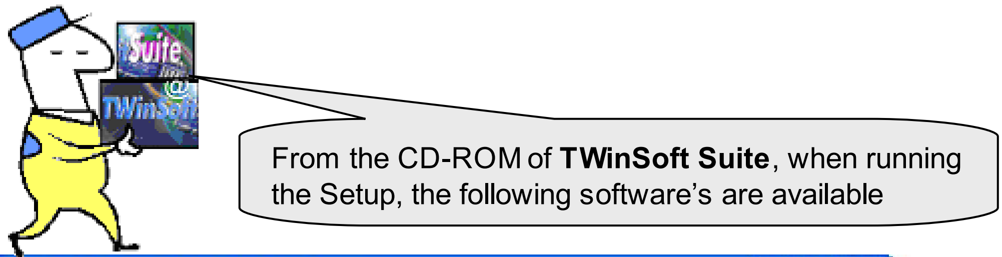


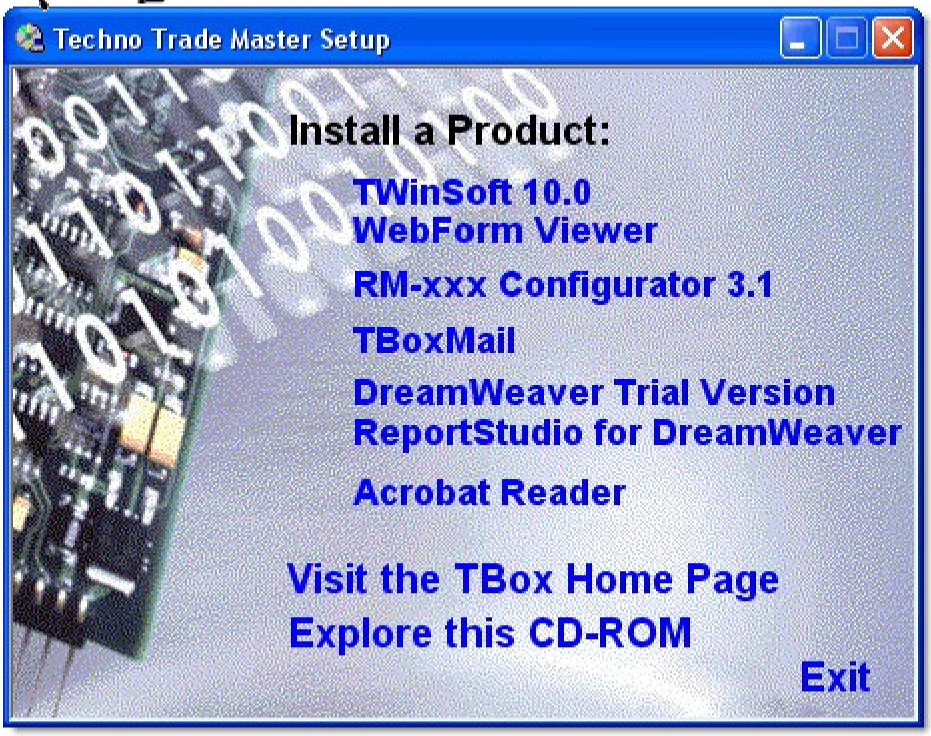
- **Hardware:** Pentium or higher.
- **Memory:** 32 MB minimum.
- **Hard Disk:** 150 MB required plus the application files.
- **Display:** VGA, SVGA with a minimum resolution of 640 x 480. We recommend 800 x 600.
- **Mouse:** any Windows compatible mouse.
- **USB port:** required in case of license with dongle for 'USB' port.
- **Serial port:** required for a local connection to ***TBox MS*** and/or for an external modem.
  If no serial port available, USB to serial adapter should be used
- **Ethernet port:** 10/100 Mbps. Required for a connection to ***TBox MS*** through a LAN.
- **Modem:** any modem properly configured in Windows.
- **Operating system:** Windows 2000, 2003, XP, VISTA

To Browse the RTU:

- **Internet Browser:** as ActiveX is used, Internet Explorer only can be used. Version 5.00 or higher is recommended to take benefit of the dialer.

3.2. Installation of the CD-ROM


Suite
TWinSoft
From the CD-ROM of **TWinSoft Suite**, when running the Setup, the following software's are available



- **TWinSoft 10.xx**

  TWinSoft is the software required for developing an application for the RTU. The basis for configuring a RTU application is explained in this manual.
  Installation of TWinSoft includes:
  - ➢ WebForm Studio: HTML editor dedicated to RTU
  - ➢ Report studio: Report editor dedicated to RTU
  - ➢ WebForm Viewer: ActiveX and *TBox MS* dialer from Internet Explorer (see next).

  (Administrator rights are required during installation)

- **WebForm Viewer**

  This software contains the tool **TBox Dial It !** used to dial *TBox MS* with Internet Explorer.
  It also contains the 'ActiveX' used to display objects dedicated to the RTU.
  It must be installed on the PC used by a operator to dial *TBox MS* with Internet Explorer, when TWinSoft is not required.
  (Administrator rights are required during installation)

- **RM-xxx Configurator**

  RM are Remote Modules, based on *TBox LITE* architecture.
  They are programmed though an interface running TWinSoft in background.
  This entry installs this interface.
  (Administrator rights are required during installation)

- **TBox Mail**

  This software is used to display a **Chart** view from data logging attached to e-mail. To store data in a global database, you should use Tview (call your local distributor).
  (Administrator rights are required during installation)

- **DreamWeaver Trial version**
- **Report Studio for DreamWeaver**

  Dreamweaver is a standard HTML editor. It can be used with the plug-in 'Report Studio for Dreamweaver' to develop standard HTML pages that do not use the ActiveX.

- **Acrobat Reader**

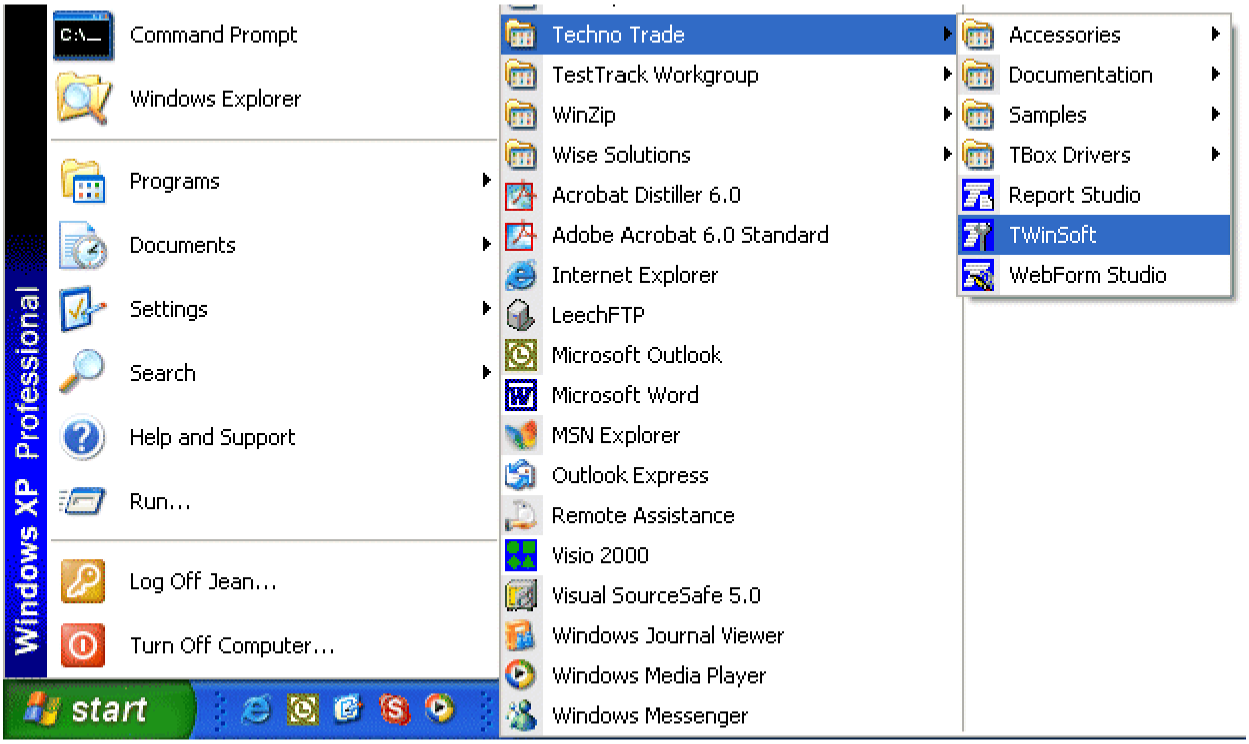
  Software needed to read our documentation.

- **Explore this CD-ROM**

  You will find on the CD-ROM many information related to ***TBox MS*** and accessories: datasheets, manuals, drivers, …

3.3. Programs of 'TWinSoft Suite'

During installation of TWinSoft, a group of programs is created where TWinSoft can be started.



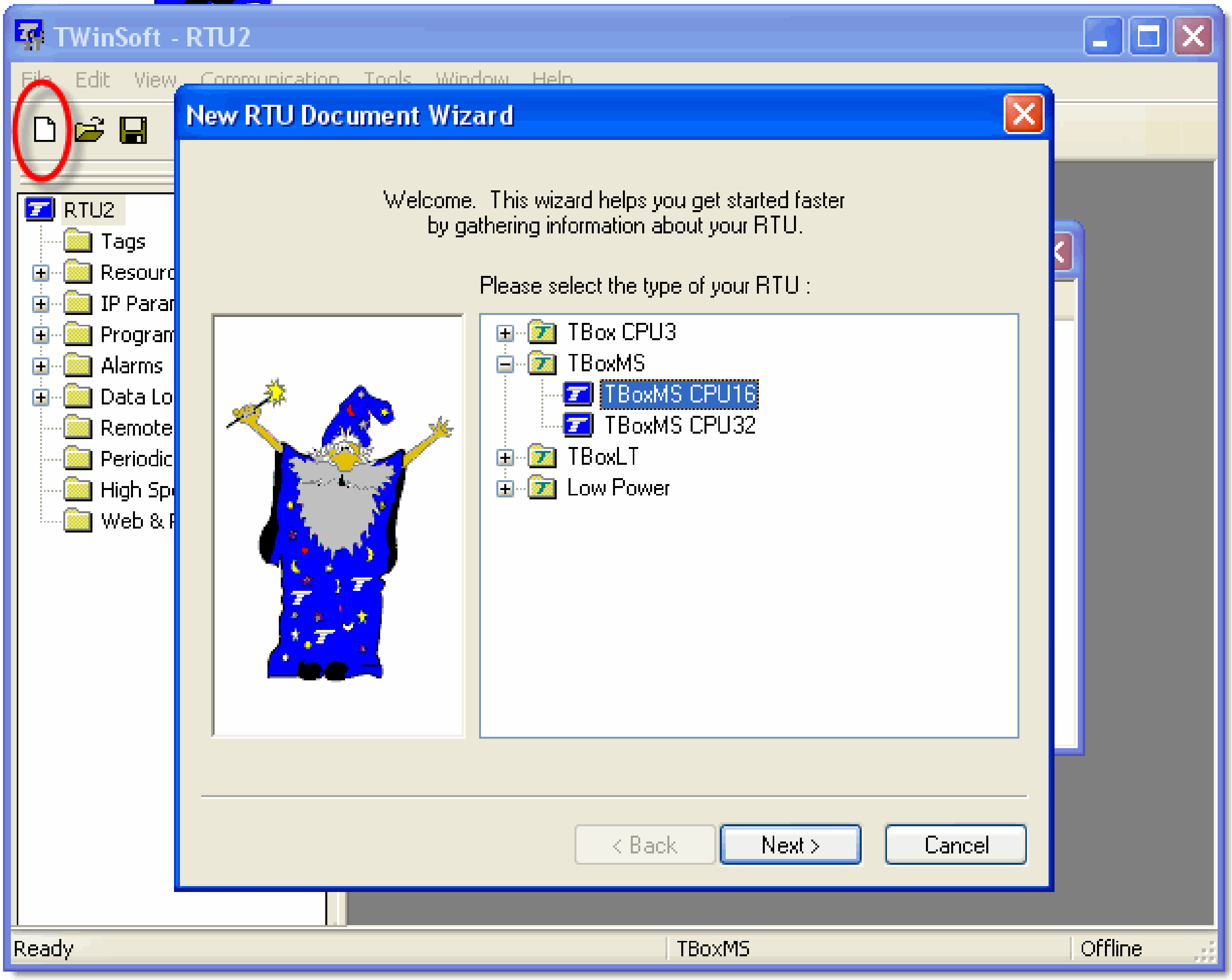
Other programs and menus:

- **Accessories:** group containing the utility 'Password generator' and 'Reset User preferences': reset of registry information to restore the default configuration of TWinSoft.
- **Documentation:** group containing the various documents associated to TWinSoft and RTU.
- **Samples:** group with TWinSoft documents installed as example.
- **TBox drivers:** when 'C' custom drivers have been installed. The 'on line' help of the driver configuration is available in this folder.
- **Report Studio:** to create reports dedicated to ***TBox MS***.
- **TWinSoft:** to start TWinSoft.
- **WebForm Studio:** to start the HTML editor, dedicated to ***TBox MS*** when it is used as a Web Server.

4. Starting TWinSoft

I am the Wizard of TWinSoft!

When you start TWinSoft the first time, or when you create a new document, I help you with some basic configurations.



Welcome. This wizard helps you get started faster by gathering information about your RTU.

Please select the type of your RTU :

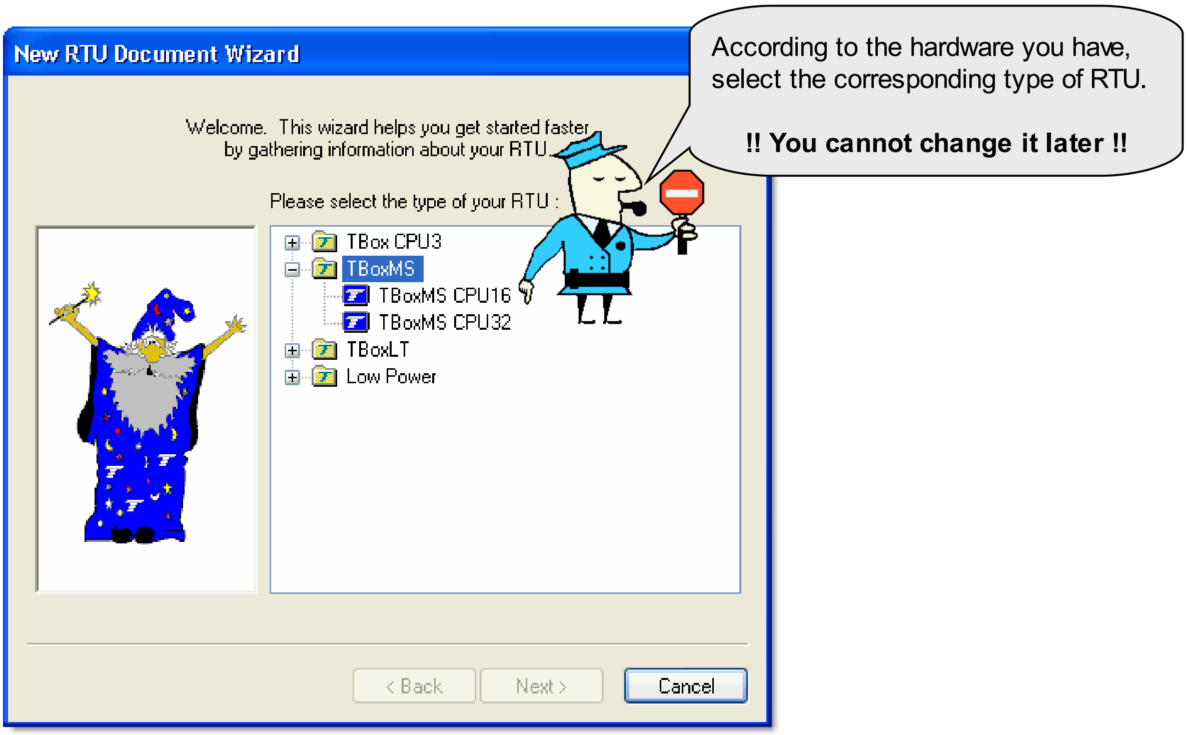
The use of TWinSoft is free, but sending a program to ***TBox MS*** is protected.

For more info about Licenses go to Appendix A. at the end of this manual.

4.1. Wizard

The 'New Document Wizard' helps you getting started with a new application by gathering information about your **hardware** and some **basic configuration**.

Except for the 'Type of RTU', all settings can be modified later from the 'RTU properties'.



New RTU Document Wizard

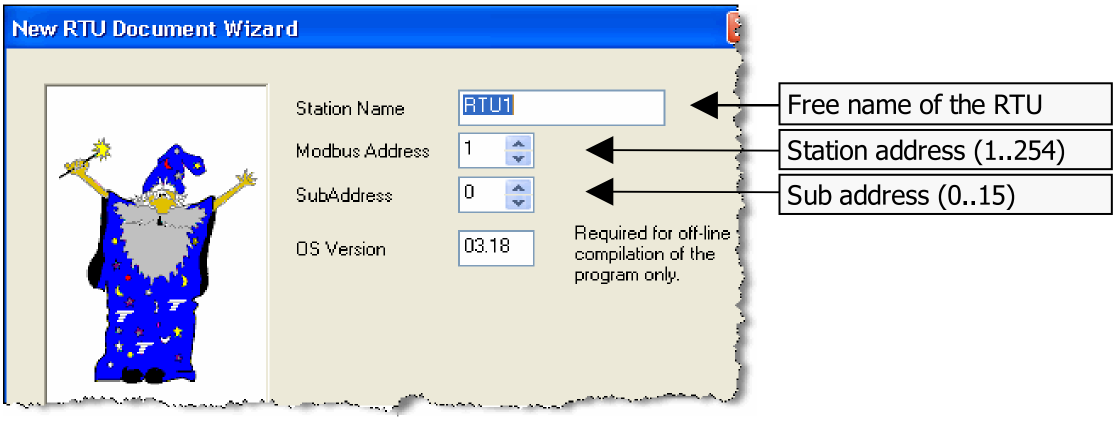
Welcome. This wizard helps you get started faster by gathering information about your RTU.

Please select the type of your RTU :

- TBox CPU3
- TBoxMS
  - TBoxMS CPU16
  - TBoxMS CPU32
- TBoxLT
- Low Power

According to the hardware you have, select the corresponding type of RTU.

!! You cannot change it later !!



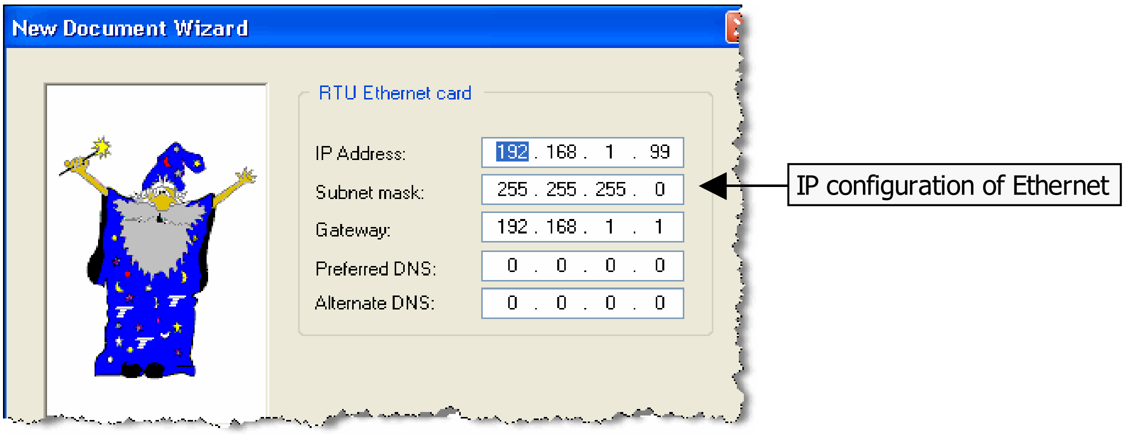
New RTU Document Wizard

Station Name: RTU1 ← Free name of the RTU

Modbus Address: 1 ← Station address (1..254)

SubAddress: 0 ← Sub address (0..15)

OS Version: 03.18 — Required for off-line compilation of the program only.



New Document Wizard

RTU Ethernet card

IP Address: 192 . 168 . 1 . 99

Subnet mask: 255 . 255 . 255 . 0

Gateway: 192 . 168 . 1 . 1

Preferred DNS: 0 . 0 . 0 . 0

Alternate DNS: 0 . 0 . 0 . 0

← IP configuration of Ethernet

4.2. Communicating with TBox MS

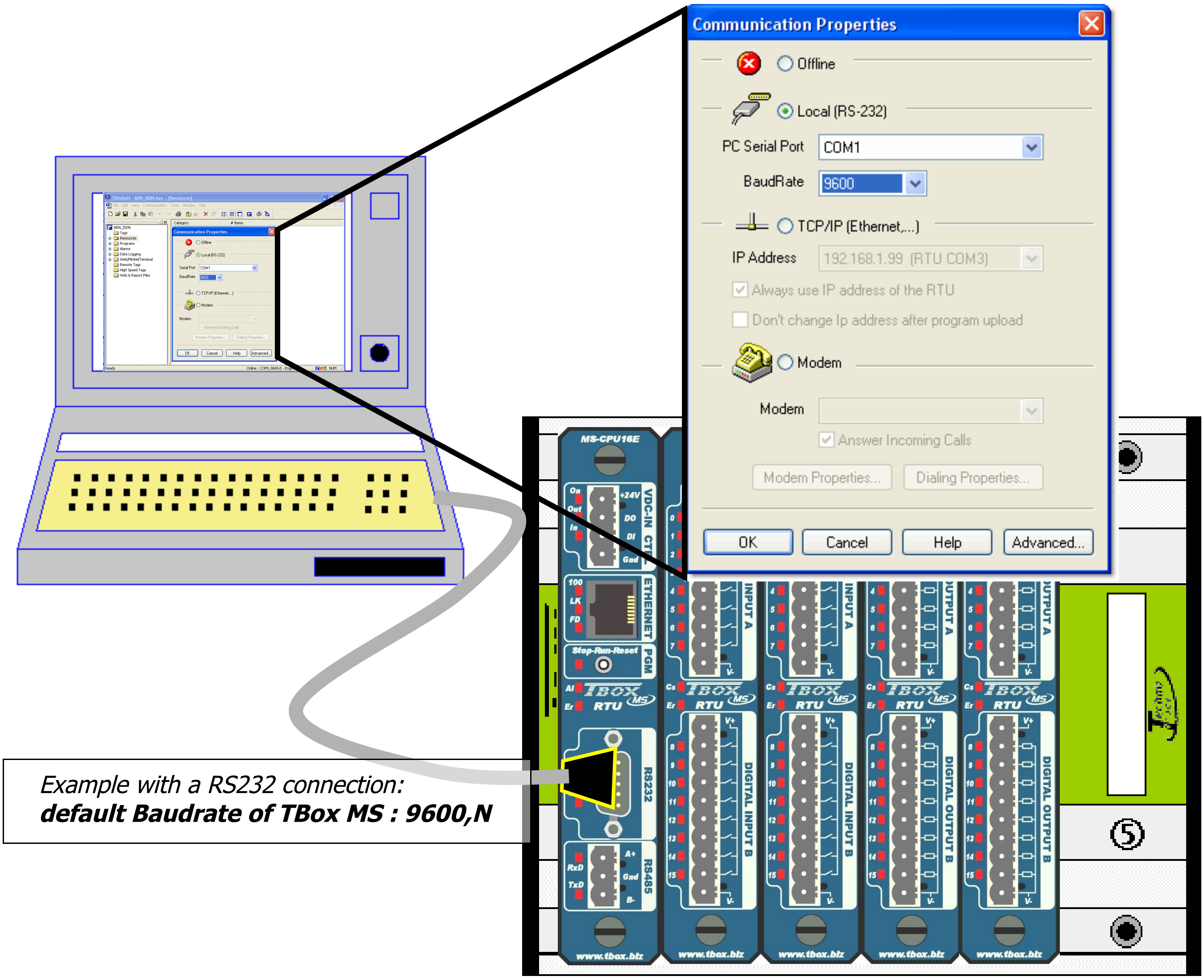
Once you have opened a document, either a new one created with the Wizard or an existing one, you can **establish the connection** with your ***TBox MS***.

The possible communications are **serial**, **Ethernet** or **modem**, according to the media used to connect to ***TBox MS***.

- Serial: check the Baudrate you have given to the serial port in your application (by default 9600,N). See chapter 7.1.1.
- Ethernet: check the IP address you have given to your ***TBox MS*** (see chapter 7.1.1) and that it is in the same subnet of the PC or accessible to the PC.
- Modem: check the tel. Number of ***TBox MS***. See chapter 6.1.

4.3. PC Communication Set up

To communicate with the ***TBox MS***, you need to select a communication media on the PC. From the main menu of TWinSoft: → **Communication → PC Setup**:



Communication Properties

○ Offline

● Local (RS-232)

PC Serial Port: COM1

BaudRate: 9600

○ TCP/IP (Ethernet,...)

IP Address: 192.168.1.99 (RTU COM3)

☑ Always use IP address of the RTU

□ Don't change Ip address after program upload

○ Modem

Modem:

☑ Answer Incoming Calls

Example with a RS232 connection:
default Baudrate of TBox MS : 9600,N

4.3.1. Communication possibilities of TWinSoft

The different communication features of TWinSoft are:

- **Offline:** this option avoids sampling ***TBox MS***

- **Local:** you select a serial port of the PC (typically RS232). The Baudrate must fit with the port of ***TBox MS*** you are connected to.

If your PC has a USB port, you can use a converter USB-RS232

- **TCP/IP:** to establish a communication in TCP/IP, typically through the Ethernet port of ***TBox MS***. TWinSoft will establish a connection with the IP address of the 'Ethernet' port of the CPU (see chapter 7.1: '***CPU resources***').
  From this *PC Setup* menu, it is also possible to specify another IP address, for instance if communicating to another Ethernet port or through GPRS.
  (See details chapter 4.3.2 below)

- **Modem:** to establish a remote connection to the ***TBox MS***. TWinSoft takes full advantage of Windows' built-in modem support: simply install your modem in the control panel's Modems applet of Windows and you are ready to call your ***TBox MS***.

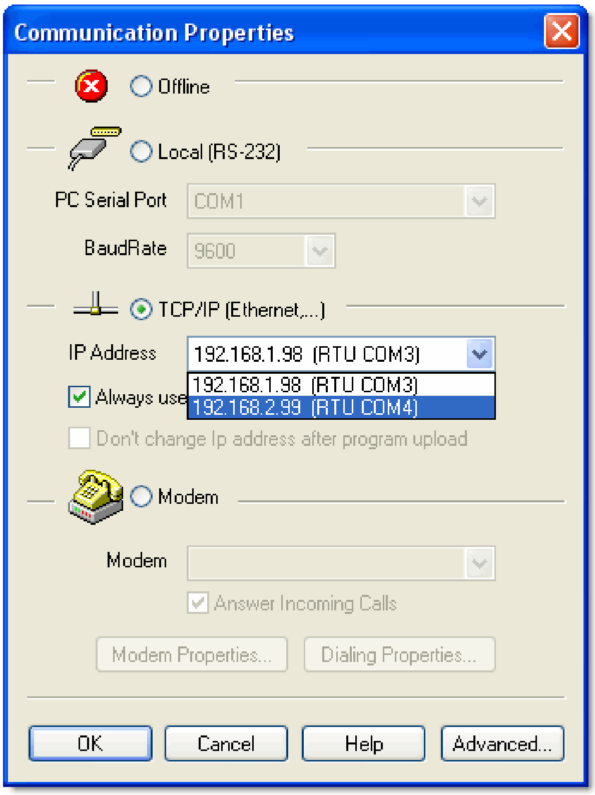
You can develop your TWinSoft document **without connection** to the ***TBox MS***, but it will be mandatory to send it to have the RTU running!

The program can be sent through **RS232**, **RS485**, **Ethernet** or **modem**.

4.3.2. IP address settings in TWinSoft PC Setup

You may encounter three different situations requiring specific IP address settings.

1. You program you ***TBox MS*** through Ethernet and **you want to keep its IP address**.



Communication Properties

○ Offline

○ Local (RS-232)

PC Serial Port: COM1

BaudRate: 9600

● TCP/IP (Ethernet,...)

IP Address: 192.168.1.98 (RTU COM3)

192.168.1.98 (RTU COM3)
192.168.2.99 (RTU COM4)

☑ Always use

☐ Don't change Ip address after program upload

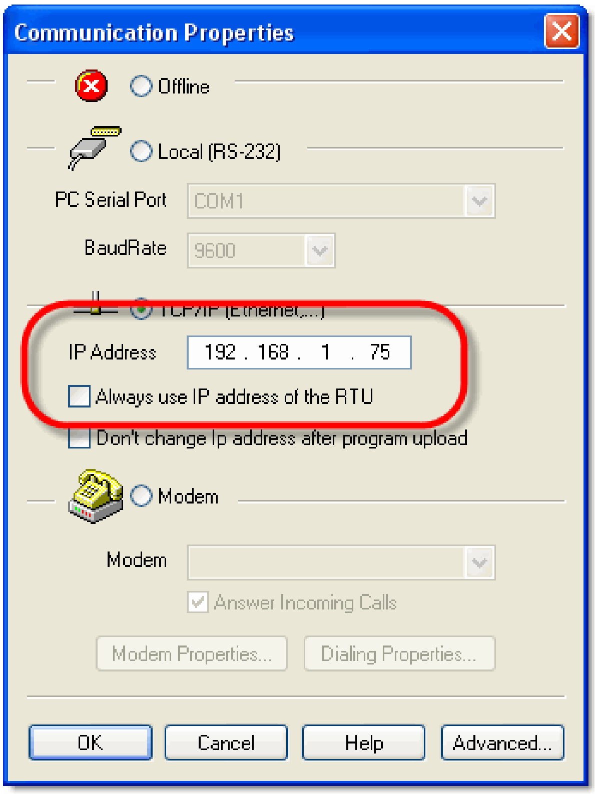
○ Modem

Modem:

☑ Answer Incoming Calls

You select in the drop list of IP addresses the one corresponding to the RTU TWinSoft is connected to.

2. You program you ***TBox MS*** through Ethernet and **you want to change its IP address**.



Communication Properties

○ Offline

○ Local (RS-232)

PC Serial Port: COM1

BaudRate: 9600

● TCP/IP (Ethernet,...)

IP Address: 192 . 168 . 1 . 75

☐ Always use IP address of the RTU

☐ Don't change Ip address after program upload

○ Modem

Modem:

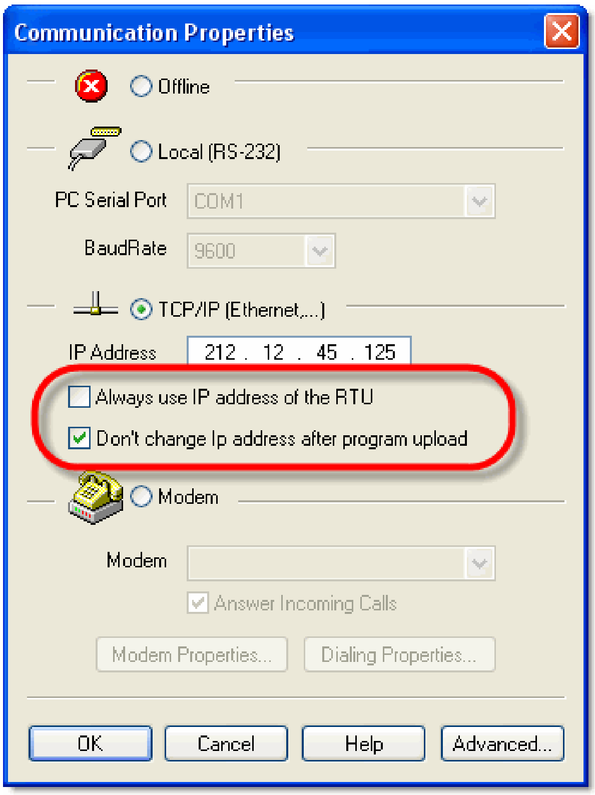
☑ Answer Incoming Calls

You type the current IP address of the port of RTU you are connected to.
When TWinSoft has finished uploading the program, **it adapts itself automatically to communicate with the IP address of port it is connected to.** (see above)

3. You **don't program** your ***TBox MS*** through a **direct Ethernet connection** and **you don't want TWinSoft to adapt to the Ethernet IP address**

   Example: you access you ***TBox MS*** through ADSL or GPRS.

   You type the current IP address of the port of RTU you are connected, for instance the GPRS IP address.
   When TWinSoft has finished uploading the program, **it does not adapt itself to IP address of Ethernet of the RTU.**



Communication Properties

○ Offline

○ Local (RS-232)

PC Serial Port: COM1

BaudRate: 9600

● TCP/IP (Ethernet,...)

IP Address: 212 . 12 . 45 . 125

☐ Always use IP address of the RTU

☑ Don't change Ip address after program upload

○ Modem

Modem:

☑ Answer Incoming Calls

4.4. Factory IP address – changing IP address

When you receive your **CPU** ***TBox MS***, its IP address is: **192.168.1.99/255.255.255.0**

TBox MS16 **does not support dynamic IP addressing** (DHCP). Then to communicate in Ethernet with your PC, you have to assure the latter is configured in the same subnet as ***TBox MS*** (see the LAN TCP/IP settings of your PC).

TBox MS32 **supports dynamic IP addressing** (DHCP)

If you wish **to change the IP address** of ***TBox MS*** to another subnet, the sequence is:

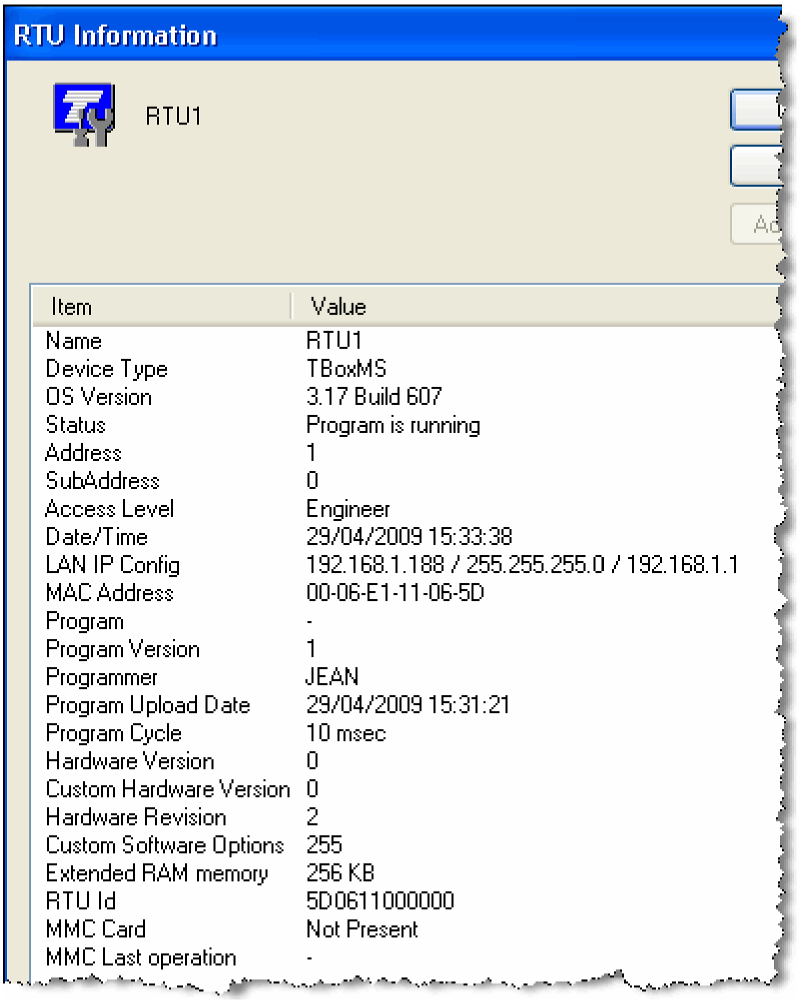
- Send program to ***TBox MS*** (at the end of sending the program you will lose communication, therefore ***TBox MS*** does not restart and its time is not set)
- Change the TCP/IP settings of your PC to the subnet of ***TBox MS***
- Reset ***TBox MS***
- Send program again

If you don't know the IP address of ***TBox MS***, you can set communication settings to the factory configuration (see chapter 4.7 below).

4.5. Testing communication

Once you have selected the media on the PC, you can **test the communication**.

From the main menu of TWinSoft: **Communication → RTU identification:**



Item	Value
Name	RTU1
Device Type	TBoxMS
OS Version	3.17 Build 607
Status	Program is running
Address	1
SubAddress	0
Access Level	Engineer
Date/Time	29/04/2009 15:33:38
LAN IP Config	192.168.1.188 / 255.255.255.0 / 192.168.1.1
MAC Address	00-06-E1-11-06-5D
Program	-
Program Version	1
Programmer	JEAN
Program Upload Date	29/04/2009 15:31:21
Program Cycle	10 msec
Hardware Version	0
Custom Hardware Version	0
Hardware Revision	2
Custom Software Options	255
Extended RAM memory	256 KB
RTU Id	5D0611000000
MMC Card	Not Present
MMC Last operation	-

Available information:

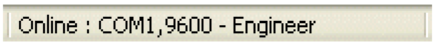
- Name of the RTU
- Type of Hardware
- Version of Operating System
- Status of the process
- ModBus address of the Station
- Subaddress of the Station
- Access level of the current user
- Date and Time in the RTU
- IP configuration of the Ethernet port
- MAC Address of the Ethernet port

- General information about the program

- Process cycle time

- Unique ID of the RTU

The **Status bar** of TWinSoft displays the status of the connection:



Online : COM1,9600 - Engineer

The media of the PC is indicated and the access level of your connection (see chapter 16: '***Security***')

If a connection cannot be established with the ***TBox MS***, it might be because the configuration of its port does not fit with the PC setup you use (different Baudrate, different IP address, protocol other than ModBus, …).

To set the ***TBox MS*** to a default configuration, you have to do a **global reset** (see next).

4.6. Reset of TBox MS

Pressing the button 'Reset', restarts the program:

- stack of alarms and stack of events are erased
- datalogging is maintained
- Tags with initial value are set to their value; others are maintained
- Timers are reset (status and value)
- Counters are maintained

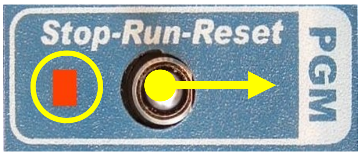
4.7. Global reset of TBox MS

The Global Reset is used to set ***TBox MS*** in a default, **well-known configuration**, in case it does not communicate anymore. Your program running in the CPU is stopped and ***TBox MS*** runs on the **Operating System** .
This is very useful when you take a CPU from the shell and you have no idea how the port you want to communicate with is configured.

The global reset is achieved using the **button on the front side** of the CPU.

Procedure:

- Push and maintain the button to the 'Reset' side
- Let the LED flashes 3 times
- Release the button



The global reset mode is indicated by the LED **flashing at 0.5 Hz** (instead of 2 Hz in RUN mode). In this mode, the ***TBox MS*** is configured as follows:

4.7.1. MS-CPU16. Global reset configuration

Port	Baudrate	Protocol	Station address	IP address
COM1 (RS232)	9600,N,8,1	ModBus	1	-
COM2 (RS485)	9600,N,8,1	ModBus	1	-
COM3 (Ethernet)	-	ModBus/TCP	1	(1) (2)
MS-PSTN; MS-GSM	-	ModBus	1	-
RS232 - modem	maintained	ModBus	1	-
RS232 - local	9600,N,8,1	ModBus	1	-

(1): current IP address maintained (up to OS 3.04.381)
..(2): 192.168.1.99 (as of OS 3.05.xxx)

4.7.2. MS-CPU32. Global reset configuration

Port	Baudrate	Protocol	Station address	IP address
COM1 (RS232)	9600,N,8,1	ModBus	1	-
COM2 (RS485)	9600,N,8,1	ModBus	1	-
COM3 (Ethernet)	-	ModBus/TCP	1	192.168.1.99
COM4 (Ethernet)	-	-	-	-
MS-PSTN; MS-GSM	-	ModBus	1	-
RS232 - modem	maintained	ModBus	1	-
RS232 - local	9600,N,8,1	ModBus	1	-

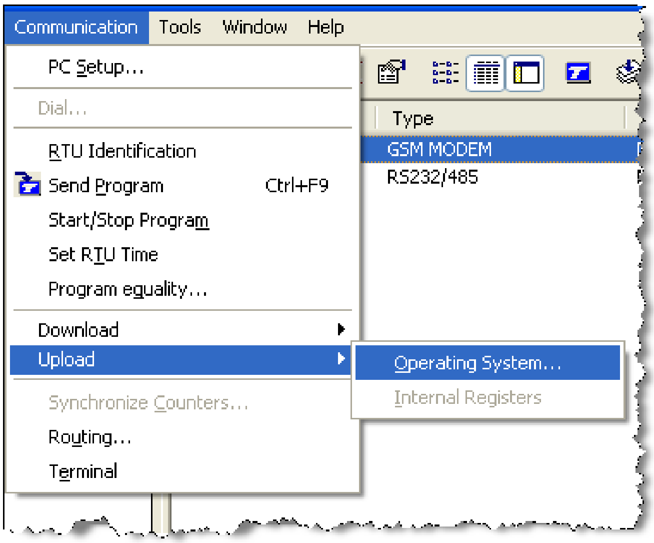
The Global Reset **does not erase the current program**. Doing an ordinary Reset will restart the program.

4.8. Upload 'Operating System'

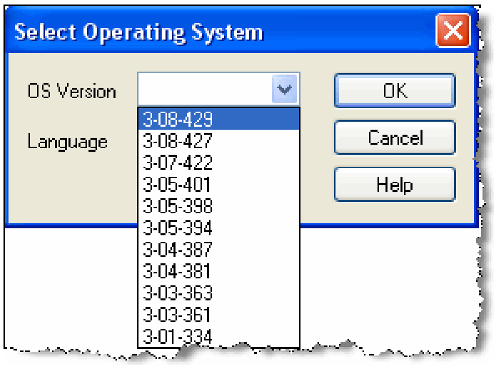
Operating System is the heart of your ***TBox MS***.
It contains all features of ***TBox MS***.

In some case you might have to change this operating system, when new features are available of a bug fix released.

From the main menu, select 'Upload OS'



Select the highest version if you want to use the latest features and corrections.



Example with Operating System for MS-CPU16

4.9. LED « RUN »

This LED is next to the "Reset" button. Its flashing frequency indicates the status of the CPU:

	MS-CPU16	**MC-CPU32**
Program runs	2 Hz	2 Hz
Program stopped	0.5 Hz	0.5 Hz
Program « Failsafe » runs	-	8 Hz
OS stopped	8 Hz	OFF

4.10. Saving and Sending a Program

Like any Windows program, TWinSoft creates 'Documents'. One document corresponds to one ***TBox MS*** application. Each of them must be saved using the Windows standard.

4.10.1. Saving a document – Backup document

Possibilities for saving a document:

- Use the icon 💾 of the main tool bar
- From the main menu use: 'File' → 'Save'
- Use the accelerator keys <CTRL + S>

Saving a document creates a file with the extension '.tws' which is your TWinSoft application. But each time a TWinSoft project '.tws' is opened successfully, it is saved in a back up file '.tbk'. If you encounter some problem retrieving your '.tws' file, you can just replace the '.tbk' extension by '.tws' and use the back up.

During the development of the application, it can be sent at any time to ***TBox MS***, for testing the program.
When sending an application to ***TBox MS***, it is first compiled and then sent, in the same sequence.

4.10.2. Compiling an application

Compilation converts the document into microprocessor code. You can execute it:

- Use the icon of the main tool bar
- Use the accelerator key <F9>

The result of the compilation is available in the **Results window**. This windows automatically pops up when there is a problem but it can be opened manually:

- from the main menu: 'View' → 'Results'
- using the accelerator keys <ALT + 2>

The **Results window** provides useful data:

Information:	indicated in black
Warning:	**indicated in bold dark green**
Error:	**indicated in bold red**

Test of memory still available

The result window also displays **memory still available**:

CPU-16(*)	**ROM: 32 kbytes**	**ROM: 512 kbytes**	**RAM: 48 kbytes**	**RAM: 320 kbytes**
Features	Application	Ladder / BASIC (64k) Sources, Web&Report	Application	Chronologies: 64 kbytes Sampling Tables: 256 kbytes

(*) : as of OS version 3.10.470 with S/N 010000 of MS-CPU16

CPU-32	**FLASH: 16 Mbytes**	**SDRAM: 64 Mbytes**	**SRAM: 1 Mbytes**	**SD: 1 Gbytes**
Features	Boot Loader, Linux, OS, Application, Sources, Web & Report	Running part of Linux, OS and Application	768 kbytes: Datalogging 256 kbytes: log file, Tag value backup	1 Gbytes: Sampling Tables

4.10.3. Sending an application

In order to have the ***TBox MS*** running with the program you have developed with TWinSoft, you have to send it. You can use any media to achieve it (RS232, modem, Ethernet, …).

Possibilities for sending a program:

- Use the icon of the main tool bar
- From the main menu use: 'Communication' → 'Send program'
- Use the accelerator keys <CTRL + F9>

The sequence for sending is Compiling + Sending.

If a problem occurs during compiling, the sequence is stopped and the 'Results' window pops up.

If you **interrupt the sending** of the program or an error happens before the end of sending, ***TBox MS*** **will not restart**, even after a reset.
The reason is that the program is composed of several modules; when starting, ***TBox MS*** checks the integrity of those modules. When they do not correspond to the same sending the program does not start, even after a reset.
You have then to re-send the program.

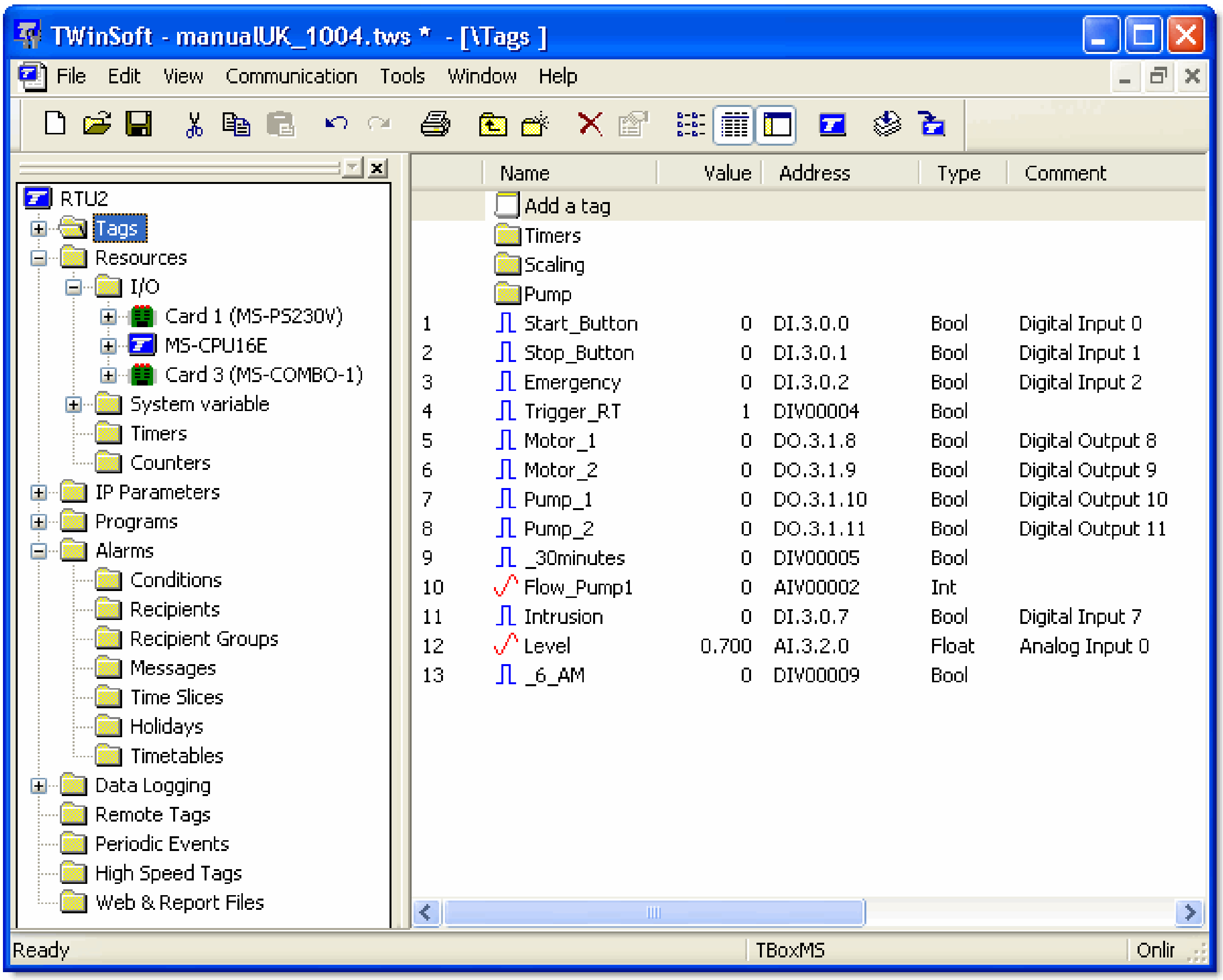
The good news is that ***TBox MS*** **keeps its original settings** before it was stopped.

TWinSoft - Programming

5. Introduction

TWinSoft uses the standard look and feel of 'Windows Explorer', with at the left side a list of folders and at the right side the content of the folder selected.

Each Folder consists in a list of items.
For instance the **list of Tags**, or in the 'Alarms' folder the **list of 'Recipients'** or in the 'Datalogging' folder the **list of 'Sampling tables'**, …



	Name	Value	Address	Type	Comment
	Add a tag				
	Timers				
	Scaling				
	Pump				
1	Start_Button	0	DI.3.0.0	Bool	Digital Input 0
2	Stop_Button	0	DI.3.0.1	Bool	Digital Input 1
3	Emergency	0	DI.3.0.2	Bool	Digital Input 2
4	Trigger_RT	1	DIV00004	Bool	
5	Motor_1	0	DO.3.1.8	Bool	Digital Output 8
6	Motor_2	0	DO.3.1.9	Bool	Digital Output 9
7	Pump_1	0	DO.3.1.10	Bool	Digital Output 10
8	Pump_2	0	DO.3.1.11	Bool	Digital Output 11
9	_30minutes	0	DIV00005	Bool	
10	Flow_Pump1	0	AIV00002	Int	
11	Intrusion	0	DI.3.0.7	Bool	Digital Input 7
12	Level	0.700	AI.3.2.0	Float	Analog Input 0
13	_6_AM	0	DIV00009	Bool	

The programming of a ***TBox MS*** application will be done in different steps:

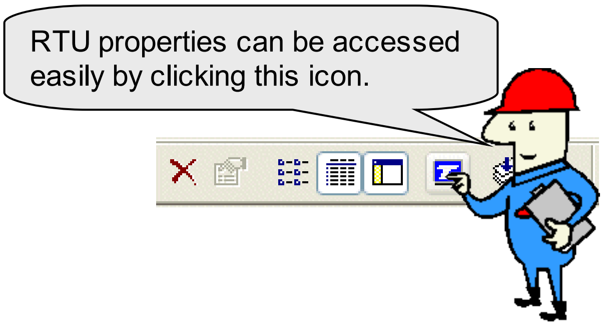
- Configuring the **RTU properties**
- Adding of the **Cards** and **Remote device** from the **Resources**
- Creating **Tags**
- Creating **Programs** using automation language Ladder and/or BASIC
- Creating **Alarms**
- Creating **Datalogging**
- Creating **Remote Tags**, if you have to exchange data with a Remote device.

The sequence in which those tasks are executed is not fixed, but at least RTU properties, Resources and Tags should be configured first, as being required for all other programming.

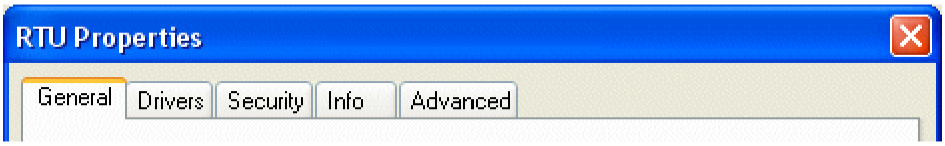
All those configurations are explained in the following chapters.

6. RTU properties

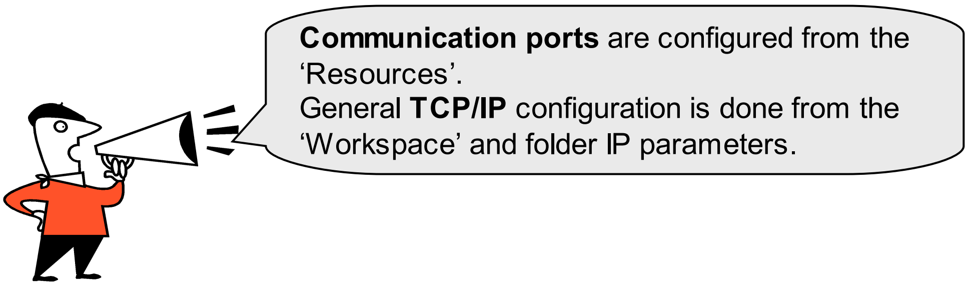
Setting the properties of the *TBox MS* has never been so easy thanks to a set of comprehensive dialog boxes, available from the main tool bar.


RTU properties can be accessed easily by clicking this icon.

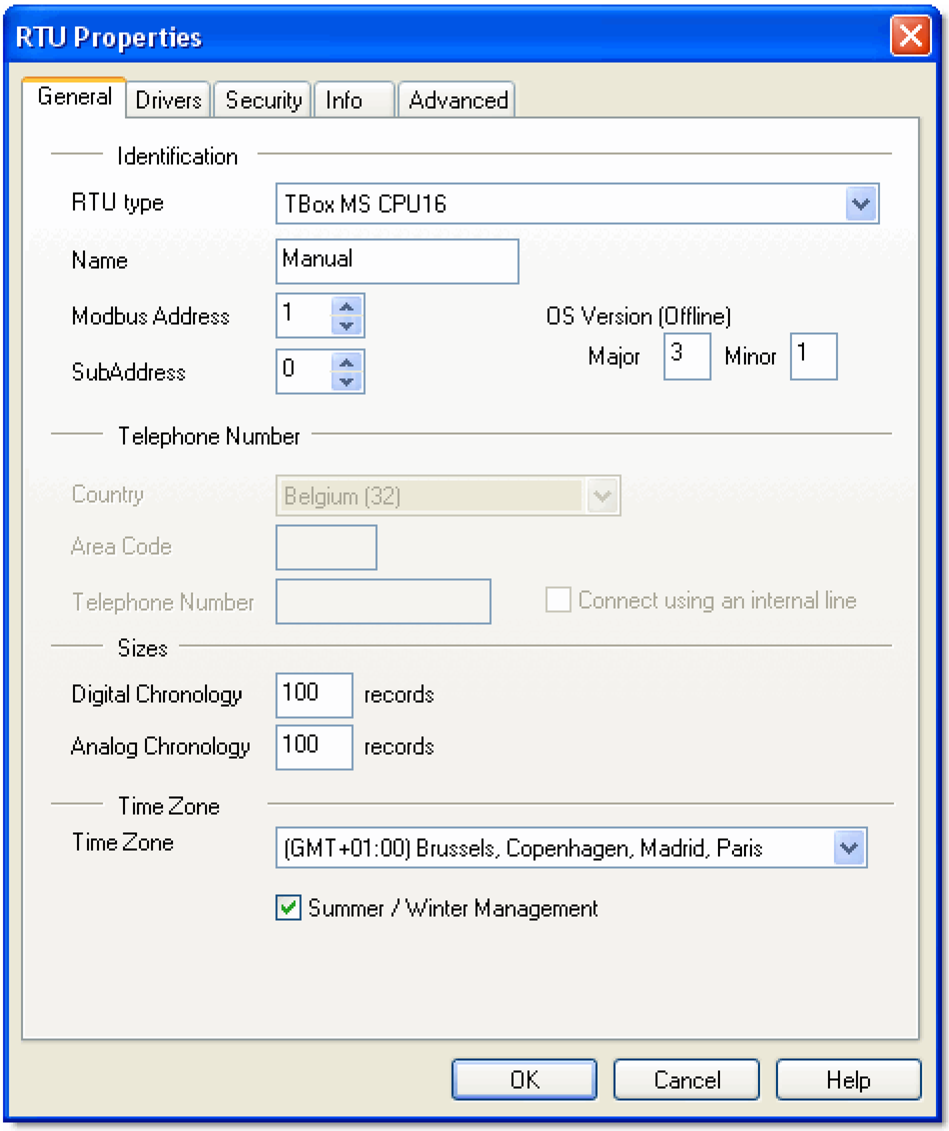
The RTU properties are divided into:



- **General** the type of the RTU, telephone number, RTU location, size of the chronologies, …
- **Drivers/Add-ons** configuration of external software modules written in 'C', used to execute specific task or to communicate with other protocol than standard ones.
- **Info** to type any info about your program, its different versions, …
- **Advanced** for some features, advanced parameters are available: during start-up, when sending alarms, about sampling tables, TCP/IP, …


Communication ports are configured from the 'Resources'.
General **TCP/IP** configuration is done from the 'Workspace' and folder IP parameters.

6.1. General properties



Identification

RTU type: TBox MS CPU16

Name: Manual

Modbus Address: 1

SubAddress: 0

OS Version (Offline) Major 3 Minor 1

Telephone Number

Country: Belgium (32)

Area Code:

Telephone Number:

□ Connect using an internal line

Sizes

Digital Chronology 100 records

Analog Chronology 100 records

Time Zone

Time Zone: (GMT+01:00) Brussels, Copenhagen, Madrid, Paris

☑ Summer / Winter Management

RTU Type: The type of RTU you have selected with the Wizard (see chapter 4.1). **It cannot be changed!**

Name: type a free name for the ***TBox MS***. It will be displayed when doing a 'RTU identification' and **used by the supervisory** Tview .
Maximum 8 characters.

ModBus address: with ModBus protocol, each device must have a **Station number**. It is its ModBus address.
Enter a number between 1 and 254 (default=1).

Sub address: if more than 254 ***TBox MS*** must be installed in one project, you need to define a Sub address. As this is not ModBus standard, it is only supported by 'TComm.dll' based software (TWinSoft, Tview , … please call your distributor for further information).
Enter a number between 0 and 255 (default=0).

OS version: when **working Offline**, it is the OS used to simulate the compilation. By default it is the OS version associated to version of TWinSoft.

Telephone number: Configuration used by TWinSoft when it needs to dial ***TBox MS***.

Sizes: Number of records of **Digital and Analog chronologies**. The chronologies are the 'on event' method of recording data in ***TBox MS*** (see chapter 12. ***Data logging***).

	MS-CPU16	***MS-CPU32***
Digital Chronologies	max. 12000	max. 32000
Analog Chronologies	max. 7000	max. 32000

Time zone: The Time Zone **where the *TBox MS* is installed**.
This information is used to create the timestamps when retrieving data from ***TBox MS*** according to its location. ***TBox MS*** uses Universal Coordinated Time (UTC) as internal timestamp. The conversion is carried out when retrieving the data.

Summer/Winter: Allows **automatic management of winter/summer time.** This selection has to be made according to the location where the ***TBox MS*** is installed.
See Appendix B : ***Time in the RTU***

6.2. Drivers / Add-ons

Supplementary softwares can be added to the TBox application. We speak of "Drivers" with MS-CPU16 and of "Add-ons" with MS-CPU32.

A driver or Add-on is a module written in 'C' that executes a specific task, non-standard.
Typically, it is communication to equipment not supporting standard protocol of ***TBox MS***.
Standard SCADA protocols are also supported: IEC-60870-5-101, -104, DNP3.0, TG800, SNMP, ...
Check availability with your distributors.

6.3. Security

Access security is discussed at chapter 16.

6.4. Info properties

You can enter a version number, the name of the programmer and a description of your program.
This information is not sent to ***TBox MS***.

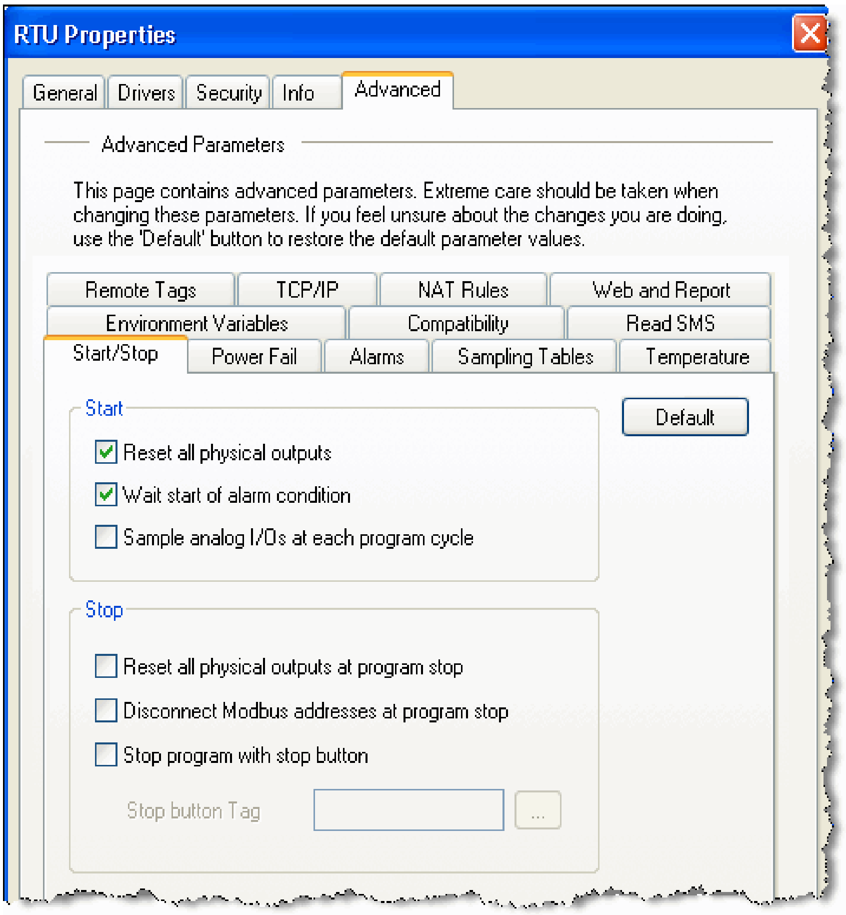
6.5. Advanced

6.5.1. Start/Stop

By Start-up we mean:

1. Reset of RTU (hardware or software).
2. Sending of Program

See also chapter 4.6 here above



This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

Start

☑ Reset all physical outputs
☑ Wait start of alarm condition
☐ Sample analog I/Os at each program cycle

Stop

☐ Reset all physical outputs at program stop
☐ Disconnect Modbus addresses at program stop
☐ Stop program with stop button

Under those conditions two mechanisms of the RTU can be customized:

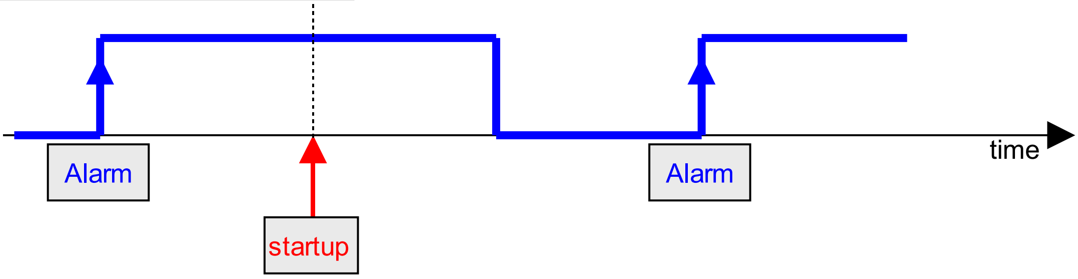
START

Reset all physical outputs at program start: when **active**, at startup the **RTU reinitializes the outputs** to ‘0’. After that the outputs are monitored according to the process.
When **not active**, at startup the **outputs are maintained to their last status**. After that the outputs are monitored according to the process.

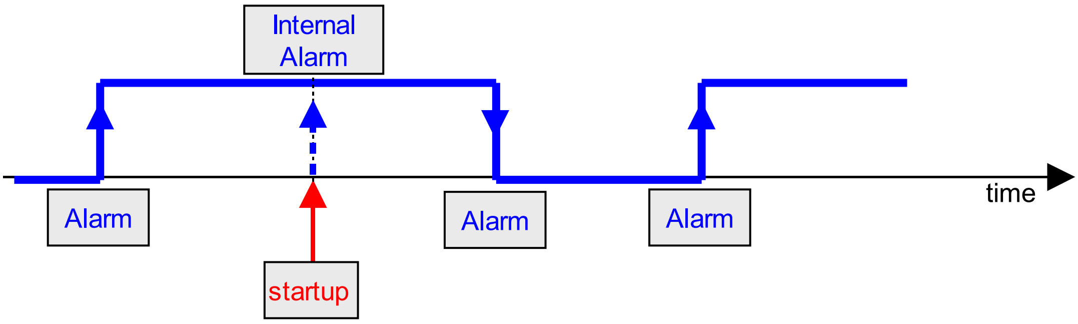
Wait start of condition: this feature relates to **alarm condition**.
The mechanism of generating alarm is based on transition: the changing of a digital Tag or the overstepping of an analog threshold.

This option allows changing this rule at startup:

With 'Wait start of condition' active:



With 'Wait start of condition' not active: if the alarm condition is true at startup, an internal 'start of alarm - auto-ack' is generated. When the alarm condition disappears, the alarm is generated.



Sample analog variable at each program cycle: as of TWinSoft 9.05.xxx and OS 3.11.xxx, sampling of analog I/O can be executed at each cycle.
This will be particularly required when doing **PID regulation**.

With previous version of OS, sampling was done each second.
To know how to check current OS version and send OS, go to chapter 4.5.

STOP

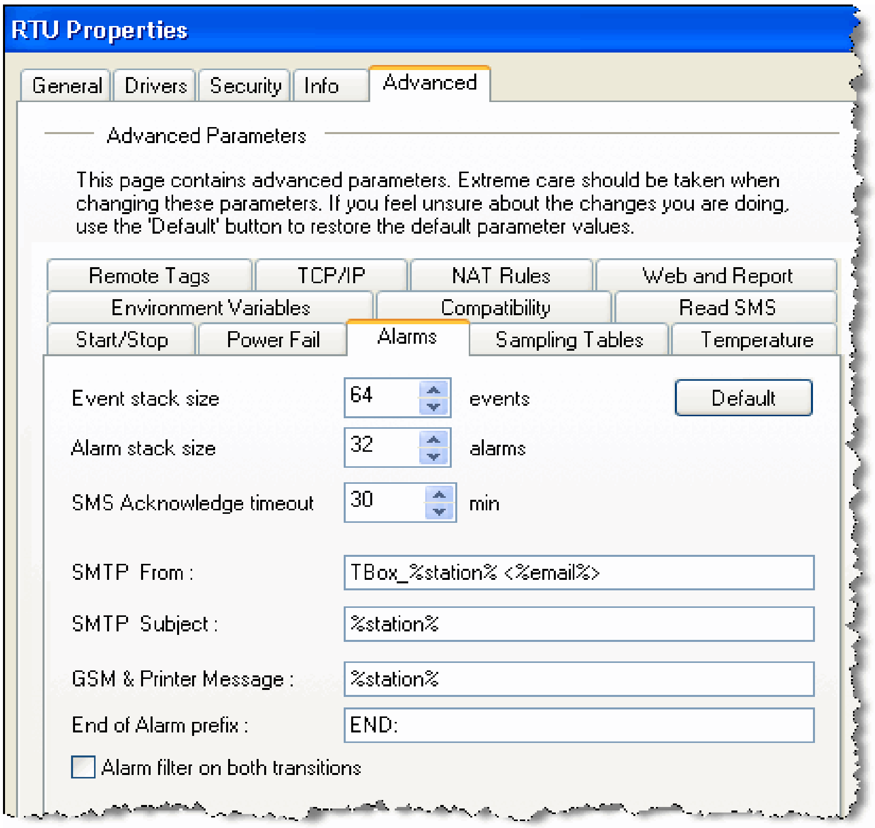
Reset All physical outputs at program stop: when this option is active, the RTU reinitializes the outputs to '0' at **stop**. This is particularly useful if you want to reset the outputs when sending a new program, and **you want to be sure they stay at '0'** during the sending and restarting sequence.
After that, outputs are monitored according to the process.

Disconnect ModBus address at program stop: all variables will have their ModBus address disconnected, which means that an external equipment accessing the RTU will receive communication error.
This feature has been implemented to allow a SCADA detecting immediately a TBox is stopped: as the ModBus addresses are not available, the RTU stays in communication but returns an 'Exception' error.

Stop program with button stop: when this feature is active, you have to select the Tag corresponding to the button 'Stop' in front of the CPU (See in the Resources --> CPU --> Group 1).
Pressing the button will stop the program (Process, Alarms, Datalogging, Remote Tags, ...)
NO other input than 'Stop' button can be used, but any internal digital register can.

6.5.2. Alarms

The advanced parameters of alarms concern the **size of the stacks** and **customizing of e-mail and GSM message**.



This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

Event stack size: 64 events

Alarm stack size: 32 alarms

SMS Acknowledge timeout: 30 min

SMTP From : TBox_%station% <%email%>

SMTP Subject : %station%

GSM & Printer Message : %station%

End of Alarm prefix : END:

□ Alarm filter on both transitions

Event stack: is a public stack where alarms are available with date, time, recipient, message, status, ….

The Event stack can be displayed from the main menu: 'Communication' → 'Download' → 'Alarms'.

The **object 'Alarms' used in a WebForm** displays the Event stack. It corresponds also to the list of Alarms sent to Tview .

Alarm stack: is an internal stack used to buffer alarms when there are several to handle.

SMTP From: when receiving an e-mail from ***TBox MS***, the field 'From' indicates the origin of the e-mail.

It accepts any text and the following parameters:

%station% : replaced by the name of the station (see General properties)
%email% : replaced by the e-mail address of the RTU

Example: TBox_%station% <%email%>

SMTP subject: when receiving an e-mail from ***TBox MS***, the field 'Subject' can be dynamized like following:

When **sending a message**, the field 'Subject' contains the message.

It accepts any text and the following parameters:

%station% : replaced by the name of the station (see General properties)
%email% : replaced by the e-mail address of the RTU
%time% : the time of the RTU when the e-mail was generated

Example: Report TBox %station% - %time% :

When **sending a report**, the field 'Subject' contains the Title of the report (see Report Studio); title that can contain the parameter **%station%** (as of TWinSoft 10.00 and OS 3.12.)

GSM & Printer message: when ***TBox MS*** sends a SMS, you can add information to the message. This information is sent in front of the message.
You can type any text and the following parameters:
%station% : replaced by the name of the station (see General properties)
%time% : the time of the RTU when the e-mail was generated
%condition% : it will result in an exclamation mark (!) in the message if the condition of the alarm is still active when the alarm is sent.

End of Alarm prefix : allows specifying a text that will be sent in front of the message, **when the alarm condition ends**, to indicate it corresponds to the End of the alarm.

Example: **END:**

Message sent when the condition ends:
END: Level too HIGH

Check the total length of SMS message does **not exceed 160 characters**

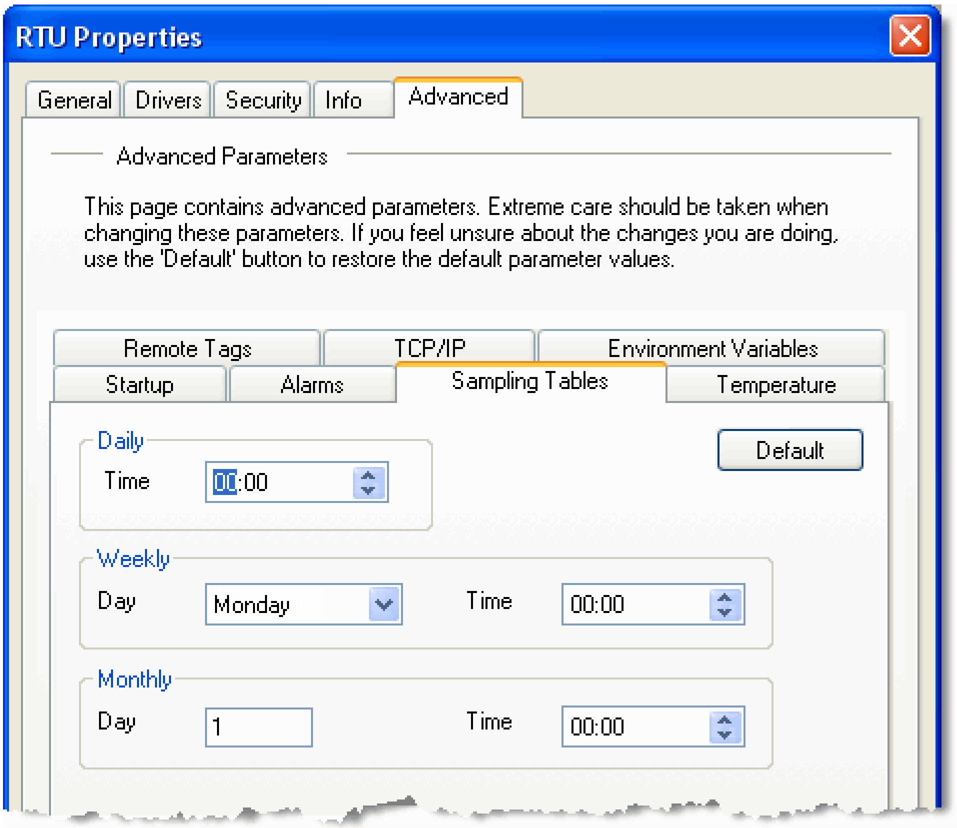
Do not use accent

Alarm filter on both transitions : this option allows computing the filter of alarm condition during **both transitions:** when the Tag value goes to alarm condition **AND** when it leaves alarm condition.
This option will be applied to **all alarm conditions**.
This is particularly useful to filter interferences on inputs.

6.5.3. Sampling Tables

This menu gives access to the parameters for **long period recording in Sampling tables**. (See chapter 12.3: '***Sampling tables***')

Those configurations concern all sampling tables.



Advanced Parameters

This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

Daily

Time: 00:00

Weekly

Day: Monday

Time: 00:00

Monthly

Day: 1

Time: 00:00

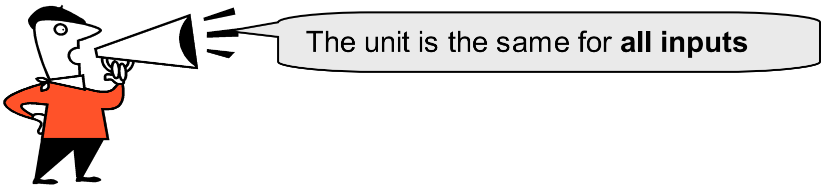
- Daily: When 'daily' is selected in sampling table, it is the time of the day the recording is executed.

- Weekly: When 'weekly' is selected in sampling table, it is the day of the week and the time the recording is executed.

- Monthly: When 'monthly' is selected in sampling table, it is the day of the month and the time the recording is executed.

6.5.4. Temperature

For Temperature analog input (PT100 or PT1000), you can define a unit: **Celsius**, **Fahrenheit** or **Kelvin**.


The unit is the same for **all inputs**

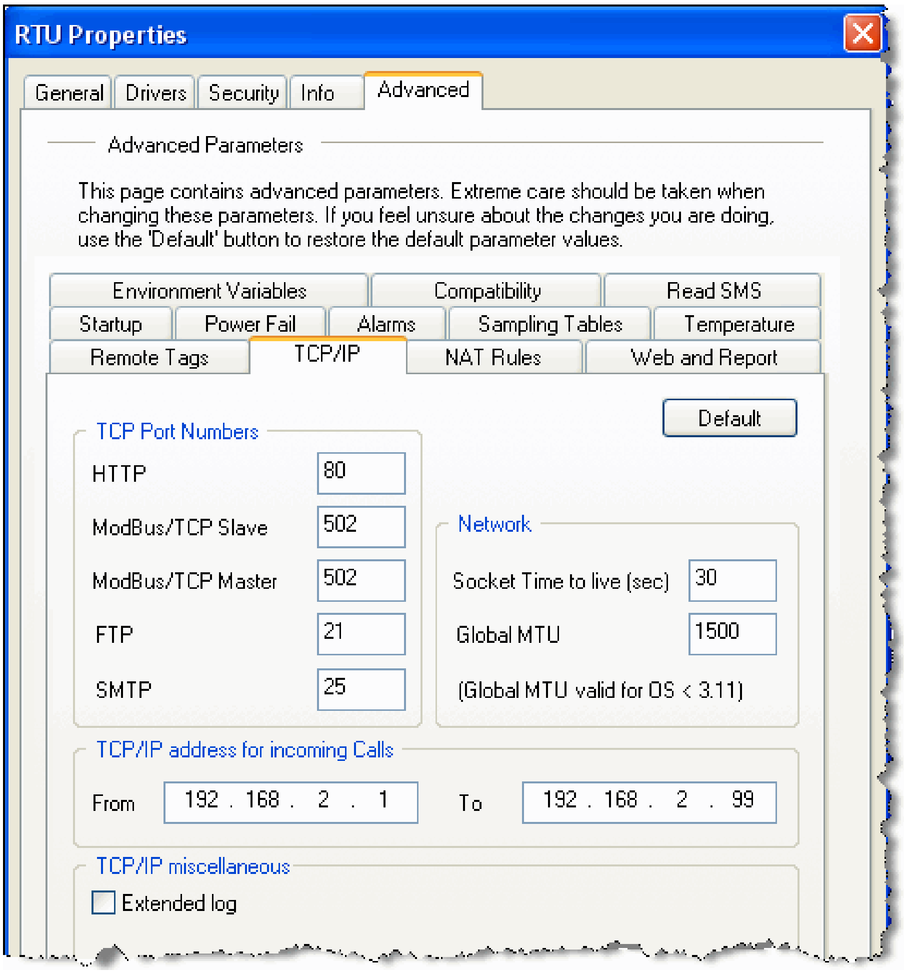
6.5.5. Remote Tags

Reset the device Trigger only if success When communicating as 'Master' using 'Remote Tags', a Trigger is associated to the device the RTU communicate with (see Remote Tags).

This Trigger activates the communication according to a 'State' or 'Edge'. Working with 'Edge', the RTU restores automatically the Tag after the transaction(s).

- With this option active: the Trigger is restored **only when communication has been done successfully**.
- Without this option: the Trigger is restored when all Remote Tags associated to the device have been executed, with or without error.

6.5.6. TCP/IP


RTU Properties

Advanced Parameters

This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

TCP Port Numbers

HTTP	80
ModBus/TCP Slave	502
ModBus/TCP Master	502
FTP	21
SMTP	25

Network

Socket Time to live (sec)	30
Global MTU	1500

(Global MTU valid for OS < 3.11)

TCP/IP address for incoming Calls

From 192 . 168 . 2 . 1 To 192 . 168 . 2 . 99

TCP/IP miscellaneous

☐ Extended log

TCP Ports Numbers

Each TCP/IP service has its own unique **TCP port**. It provides a logical location for the delivery of TCP data.

TCP Port number complies to a standard defined by the IANA to be sure everyone using a TCP service uses the same TCP ports according to protocols used.
When working with ***TBox MS***, in some cases, you might want to change this port number.

HTTP: port used to access ***TBox MS*** as WebServer (by default=80).

ModBus/TCP-Slave: port used by a 'Master' to access ***TBox MS*** as 'Slave' (TCP port 502 still remains active for TWinSoft) (by default=502)

1. Changing the TCP port does not affect access from TWinSoft (which uses port 502).
2. The changing of TCP port is automatically applied to 'WebForms' when building the HTML pages using WebForm Studio.

ModBus/TCP-Master: port used by ***TBox MS*** as 'Master', to access a remote device (by default=502).

FTP: port used by ***TBox MS*** to send Files (by default=21).

SMTP: port used by ***TBox MS*** to send e-mails (by default=25).

Global MTU (MS-CPU16)

The MTU determines the maximum size of a TCP frame, by default 1500 bytes **(1500 bytes is the maximum)**.
If some intermediate equipments (router, switch, ...) do not support this value it can be reduced.

As of OS 3.11.xxx, MTU size is adjustable separately for each configuration port (see in the communication port: TCP/IP 'advanced' parameters)

TCP/IP addresses for incoming calls

Range of addresses used during incoming calls.
TBox MS uses the first address of the range and applies the following to the **remote equipment**.

Typically, this information is needed when ***TBox MS*** is used as a Web Server, dialed from Internet Explorer and **TBox Dial It!**.
The utility **TBox Dial It!** , used to dial ***TBox MS*** automatically, detects the IP address and uses it as URL.

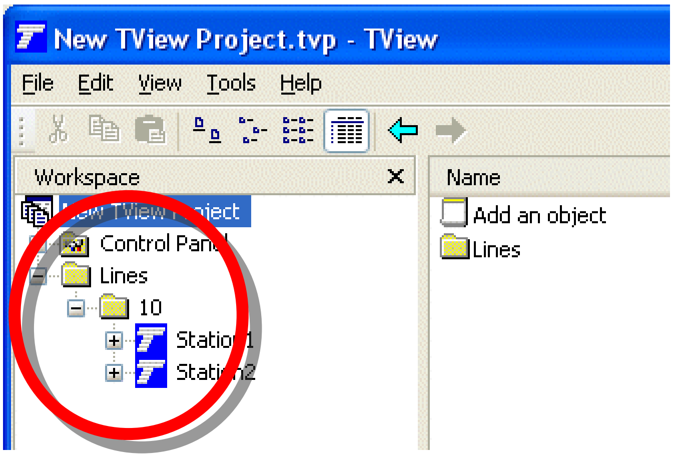
Avoid using addresses in the **same range as the IP address defined for the LAN card of the PC** used as Browser.

<u>TCP/IP miscellaneous</u>

Extended Log (MS-CPU16): MS-CPU16 provides a debugging mode to test TCP/IP connection (see appendix G.2.)
The extended log adds any IP information sent/received by MS-CPU16. It allows extended tracing of TCP/IP connection.
Debugging uses Analog Chronology table. Check its size is sufficient (see chapter 4.1. ***General RTU properties***).

6.5.7. Environment variables

The environment variables are used when particular configuration might be needed in external software.
Available only when sending historical data through .tma file.

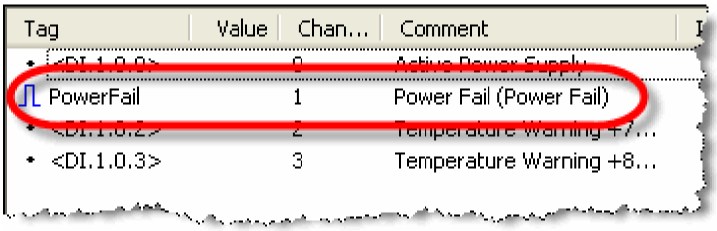
Variable	Value	Description
`TViewPath`	\path	The path in which the station will be created when importing data in Tview . The path is the relative path from the Project workspace of Tview . *<u>Example:</u>* with the Value: **\Lines\10** Result in Tview :  New TView Project.tvp - TView File Edit View Tools Help Workspace New TView Project Control Panel Lines 10 Station1 Station2 Name Add an object Lines
`Longname`	Type any long name	The name typed here will be used in Tview , instead of the one declared in the 'General' properties, which is limited to 8 characters

6.5.8. Power Fail

Working with a backup battery (available on MS-PS230 and MS-PS-DCN), the RTU informs you when the main voltage is out of order and the RTU is powered from the battery.

A variable informs that the main power broke down.

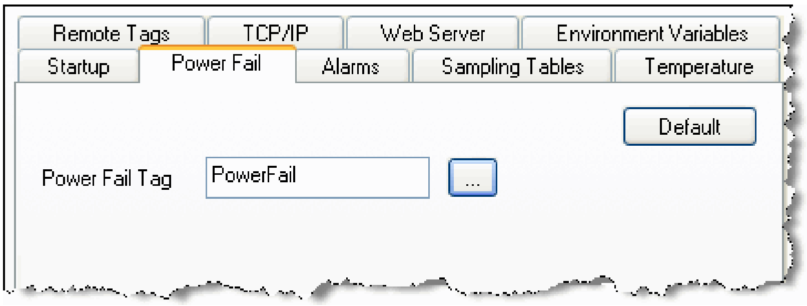
Example from the MS-PS230:



Tag	Value	Chan...	Comment
<DI.1.0.0>		0	Active Power Supply
PowerFail		1	Power Fail (Power Fail)
<DI.1.0.2>		2	Temperature Warning +7...
<DI.1.0.3>		3	Temperature Warning +8...

From the list of DI available with the card, you Tag the one indicating the power failure (DI.1.0.1)

From the RTU properties: → Advanced → Power Fail you select the Tag corresponding to the Power Fail.



Power Fail Tag: PowerFail

This power fail information is then available for alarm and chronology condition where you have specified a handling associated to 'Power Failure': in case of power failure, the alarm and chronology conditions will not be executed.

Also, the Tag you have created (in this example 'PowerFail') can be used to send an alarm and can be recorded into chronologies (datalogging).

6.5.9. Web and Report

Check user's WebFormViewer version: You activate the verification done by the WebForm Viewer.
When creating a WebForm, an indication of minimum version of the Viewer is declared in HTML pages sent in ***TBox MS***. When going in connection with IE, WebForm Viewer will check the version of WebForm, and in case it is newer, display a message (see next).

Message: In case you have activated the option, you can specify a text that will be displayed in a message box.
This message box appears when connecting with IE to a WebForm that needs an update of WebForm Viewer to be displayed.
This information mainly depends on the type of connection used to access TBox:

- The TBox is accessed through a modem point to point connection: as it is impossible to access Internet from this connection, you type a message to inform on the procedure to access Internet and download the WebForm Viewer. It can be from TBox manufacturer site (see below).

- The TBox is on Internet or part of a LAN: the message informs on the situation. By clicking 'OK', you jump to the URL (see next).

Download new version: This option can be checked to automatically download the last version of WebForm Viewer. It will be used in 2 cases:

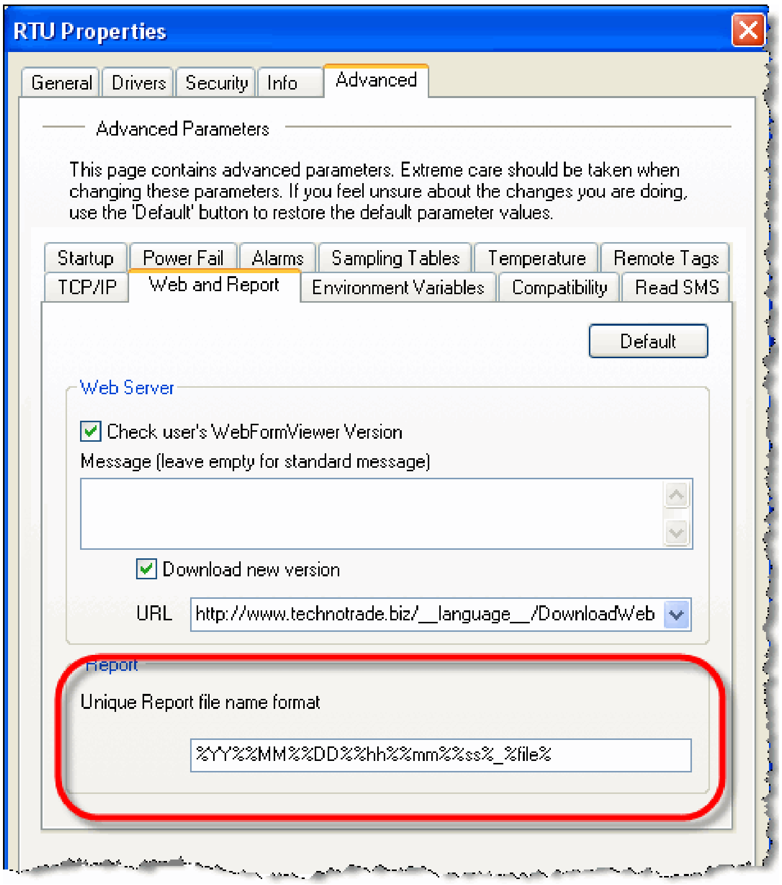
- The TBox is connected to Internet:. then you have also direct access to Internet to download WebForm Viewer. You can leave the URL of the manufacturer: http://www.tboxsupport.biz/free_downloads/DownloadWebFormViewer.html

- The TBox is connected on a LAN: and one of the PC of the LAN contains the WebForm Viewer. You type the URL of the PC.
Example: \\PCServer\C\TBox\Download\DownloadWebFormView.htm

Unique Report file name format: When sending a report by FTP, you have the choice of sending the report with 'Unique file name' (see Report Studio → report properties → Advanced). In this case, the RTU includes supplementary parameters in head of the name of the report.

Accepted parameters are:

%station%:	name of the RTU
%email%:	e-mail of the RTU
%time%:	complete date & time
%condition%:	! (if alarm active)
%YY%:	year in 2 digits
%YYYY%:	year in 4 digits
%M%:	month in 1 digit (if possible)
%MM%:	month in 2 digits
%MONTH%:	month in letters
%D%:	day in 1 digit (if possible)
%DD%:	day in 2 digits
%h%:	Eur. hour in 1 digit (if possib.)
%hh%:	Eur. hour in 2 digits
%H%:	US hour in 1 digit (if possible)
%HH%:	US hour in 2 digits
%mm%:	minute in 2 digits
%ss%:	second in 2 digits
%file%:	name of the report
%ampm%:	US time am/pm
~mytag~:	value of Tag



This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

☑ Check user's WebFormViewer Version

Message (leave empty for standard message)

☑ Download new version

URL http://www.technotrade.biz/__language__/DownloadWeb

Unique Report file name format %YY%%MM%%DD%%hh%%mm%%ss%_%file%

Any supplementary text can be added.

7. Resources

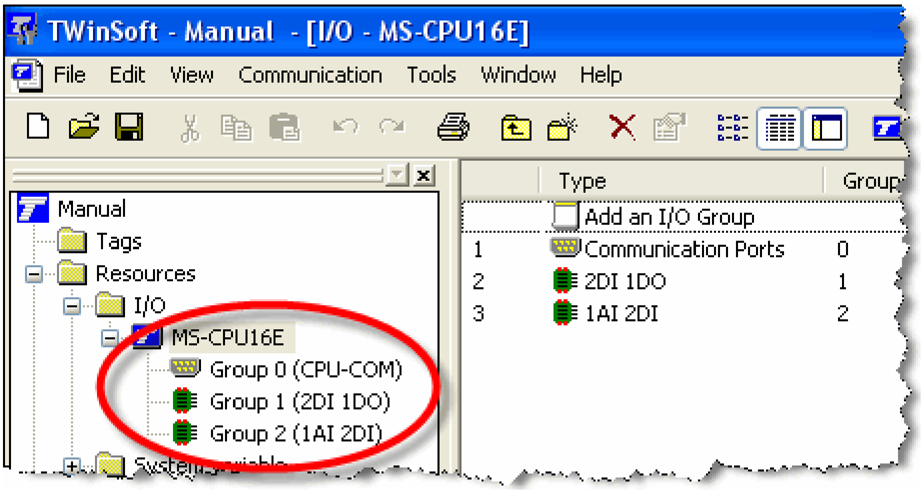
The resources represent the list of the **hardware** that your ***TBox MS*** has at its disposal.

- The CPU: including its communication ports and internal I/O (see chapter 7.1: ***'The CPU card'***)
- The Cards: communication and I/O fixed in the same Rack as the CPU (see chapter 7.2: ***'Adding Cards'***)
- The Remote Device: if the CPU needs to communicate in 'ModBus Master' to another device (CPU, or an external ModBus device), the latter must be declared as a Remote I/O card (see chapter 13: ***'Remote Tags'***)
- The System Variables: variables having pre-defined function (see chapter 7.4: ***'System variables'***)
- Timers/Counters: used in Ladder/BASIC (see another manual ***"BASIC & Ladder for TBox"***)

7.1. The CPU card

When starting a new document, TWinSoft creates automatically the CPU card corresponding to the selection in the wizard (see chapter 4.).

The communication ports of the CPU with their associated configuration and the I/O of the CPU are available from the 'Resources':



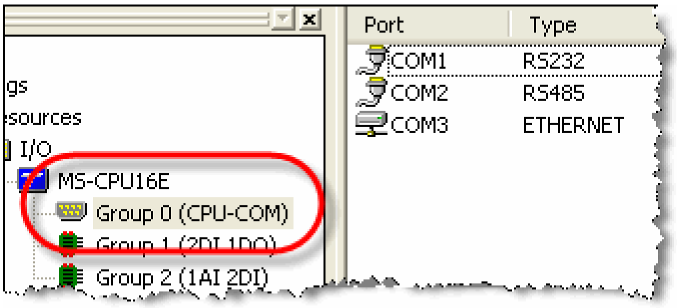
	Type	Group
	Add an I/O Group	
1	Communication Ports	0
2	2DI 1DO	1
3	1AI 2DI	2

Example with MS-CPU16

The CPU card is divided in several **groups.**
Example with a MS-CPU16:

- **Group 0 :** communication ports
- **Group 1 :** 2 digital inputs - 1 digital output (Sync. Input, Sync. Output, STOP input,)
- **Group 2 :** 1 Analog input - 2 digital inputs (Power supply voltage, temperature warnings)

7.1.1. Communication ports of the CPU



Port	Type
COM1	RS232
COM2	RS485
COM3	ETHERNET

Example with MS-CPU16

By selecting the Group 0 **Communication ports** in the workspace, you access each port separately.

Communication ports tabs

Depending on the type of communication port (RS232, RS485, modem or Ethernet), different tabs are available:

Parameters: general parameters (local or modem, Baudrate, Protocol).

DCV: **D**igital **C**ommunication **V**ariables. Special variables with a pre-defined function (communication error, modem online, …). (see chapter 7.3)

ACV: **A**nalog **C**ommunication **V**ariables. Special variables with a pre-defined function (time-out, user ID, …). (see chapter 7.3)

Advanced: mainly 'timing' parameters required when CPU is 'Master' or 'Slave' in a ModBus communication.

TCP/IP: TCP IP configuration dedicated to the communication port, when available.

To enter the **configuration** of the communication port, double click the port in 'Group 0'.

Serial port configuration

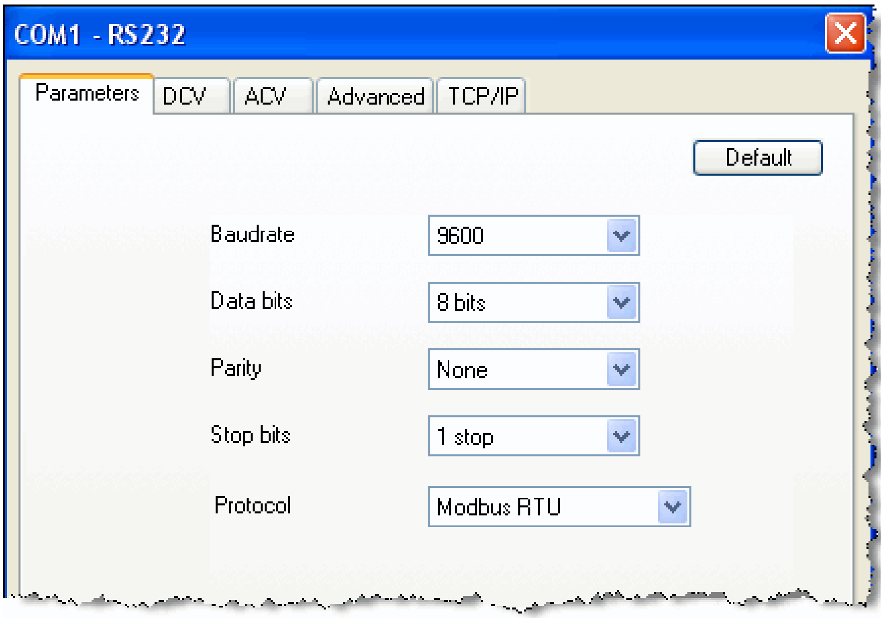
Baudrate: 200…115200 bps

Data bits: 7 or 8

Parity: None, Odd, Even, Space, Mark

Stop bits: 0, 1 or 2

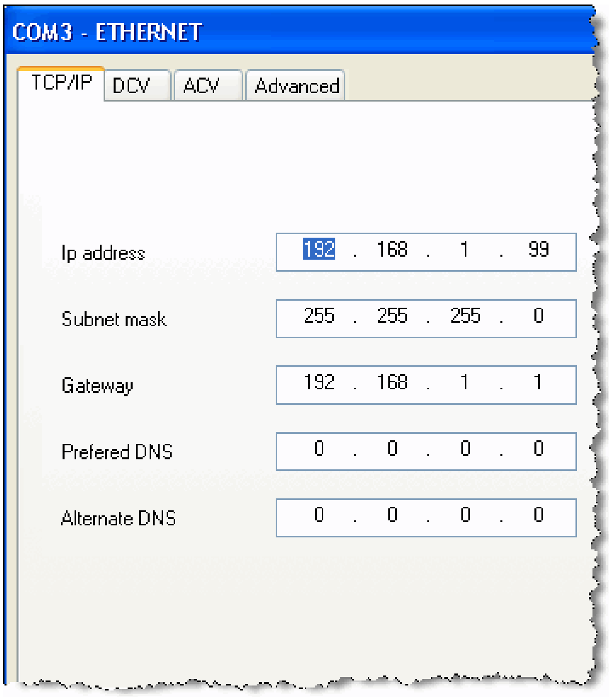
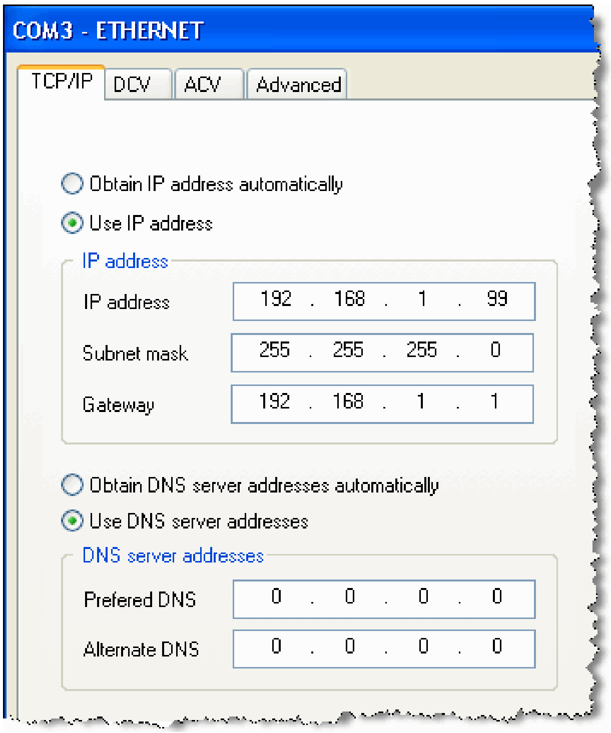
Protocol:
ModBus (RTU/ASCII), Printer, NMEA, PPP, SLIP



Baudrate: 9600
Data bits: 8 bits
Parity: None
Stop bits: 1 stop
Protocol: Modbus RTU

Example with COM1 – RS232

Ethernet configuration

MS-CPU16	MS-CPU32
 COM3 - ETHERNET TCP/IP · DCV · ACV · Advanced Ip address: 192 . 168 . 1 . 99 Subnet mask: 255 . 255 . 255 . 0 Gateway: 192 . 168 . 1 . 1 Prefered DNS: 0 . 0 . 0 . 0 Alternate DNS: 0 . 0 . 0 . 0	 COM3 - ETHERNET TCP/IP · DCV · ACV · Advanced ○ Obtain IP address automatically ● Use IP address IP address IP address: 192 . 168 . 1 . 99 Subnet mask: 255 . 255 . 255 . 0 Gateway: 192 . 168 . 1 . 1 ○ Obtain DNS server addresses automatically ● Use DNS server addresses DNS server addresses Prefered DNS: 0 . 0 . 0 . 0 Alternate DNS: 0 . 0 . 0 . 0
MS-CPU16 does not support DHCP	MS-CPU32 supports DHCP

IP address the IP address of the Ethernet of ***TBox MS*** (given by the network administrator).

Working with **several Ethernet ports** in your ***TBox MS***, check you have IP addresses in **different subnets**

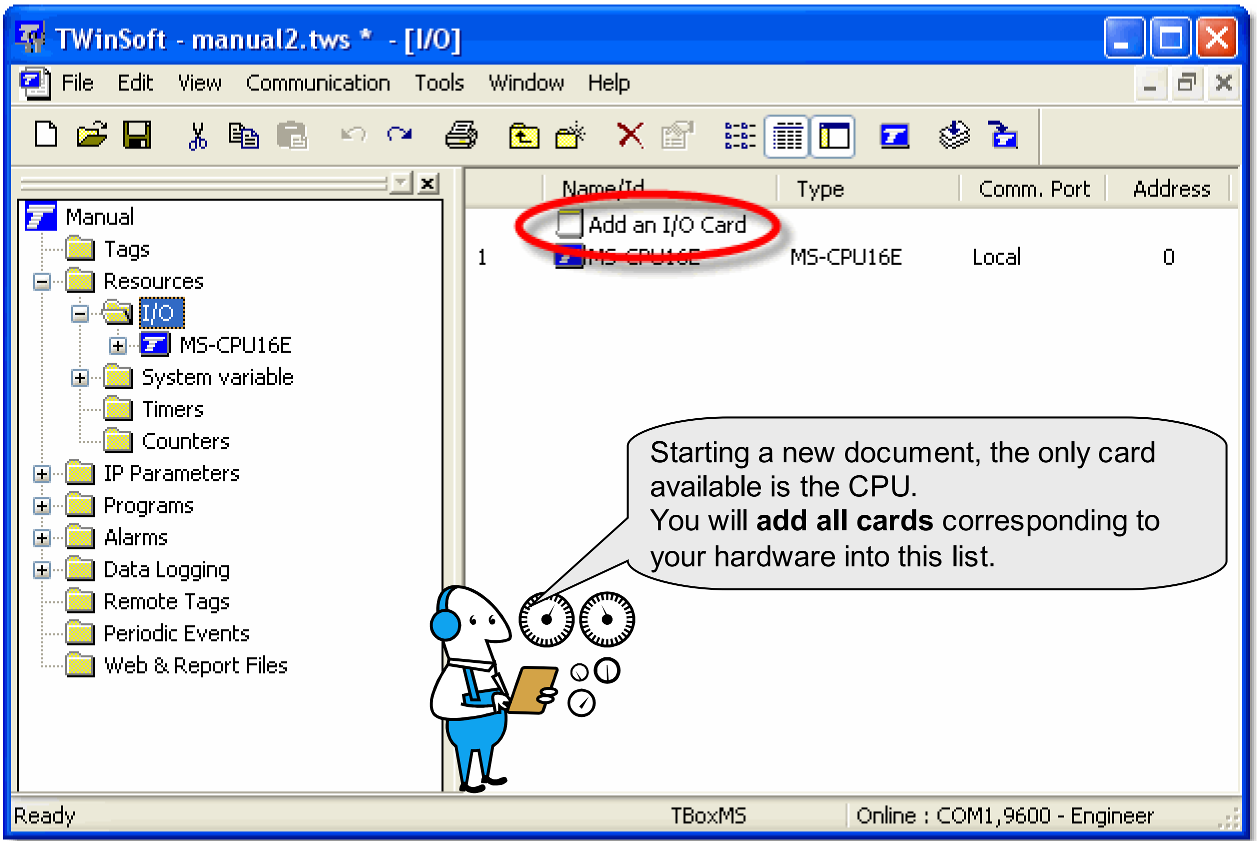
Subnet mask the subnet mask defined by the subnet the ***TBox MS*** will be included in (given by the network administrator).

Gateway the IP address of the equipment on the LAN, that ***TBox MS*** uses to access an IP address outside its subnet.

DNS DNS Server is used to resolve 'Names' in 'IP address' (given by the network administrator).
The DNS can be the same as your gateway or the one of the ISP. It depends on your network architecture.

7.2. Adding Cards

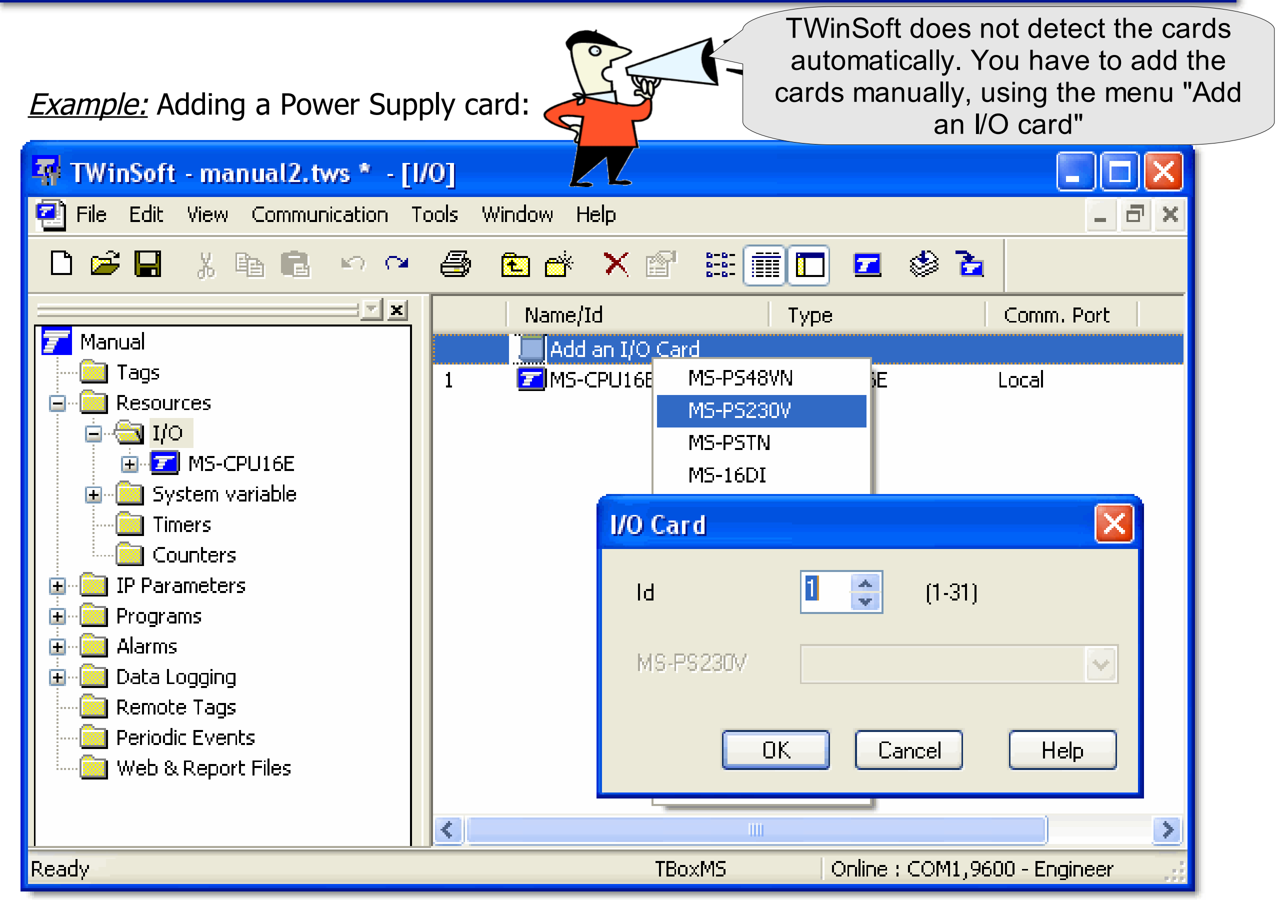
All cards other than the CPU must be added in the 'Resources' folder: I/O cards as well as communication cards.



	Name/Id	Type	Comm. Port	Address
	Add an I/O Card			
1	MS-CPU16E	MS-CPU16E	Local	0

Starting a new document, the only card available is the CPU.
You will **add all cards** corresponding to your hardware into this list.

Example: Adding a Power Supply card:



TWinSoft does not detect the cards automatically. You have to add the cards manually, using the menu "Add an I/O card"

	Name/Id	Type	Comm. Port
	Add an I/O Card		
1	MS-CPU16E	MS-CPU16E	Local

I/O Card

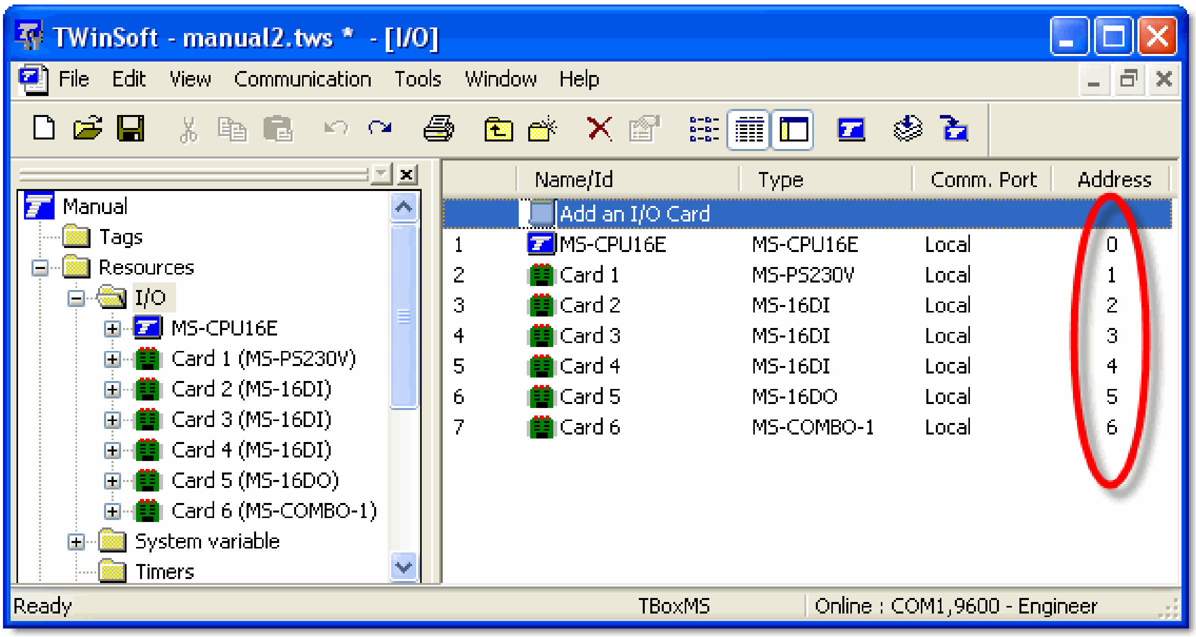
Id 1 (1-31)

MS-PS230V

Id number of the cards in TWinSoft vs. Slot in the Rack:

Type of Card	Slot used in the Rack	Address in TWinSoft
Power Supply (if used)	**If slot 0** **Other slot**	1 Slot Id
MS-CPU (w/o redundancy)	**0:** when used **without Power Supply** **1:** when used **with a Power supply** or alone **in prevision** of using a Power Supply	**Always 0**
MS-CPU32 (with redundancy)	**CPU1: 0** **CPU2: 1**	**Always 0** **Always 0**
I/O card Communication card	Any slot following the CPU	Same as the slot index

Example:

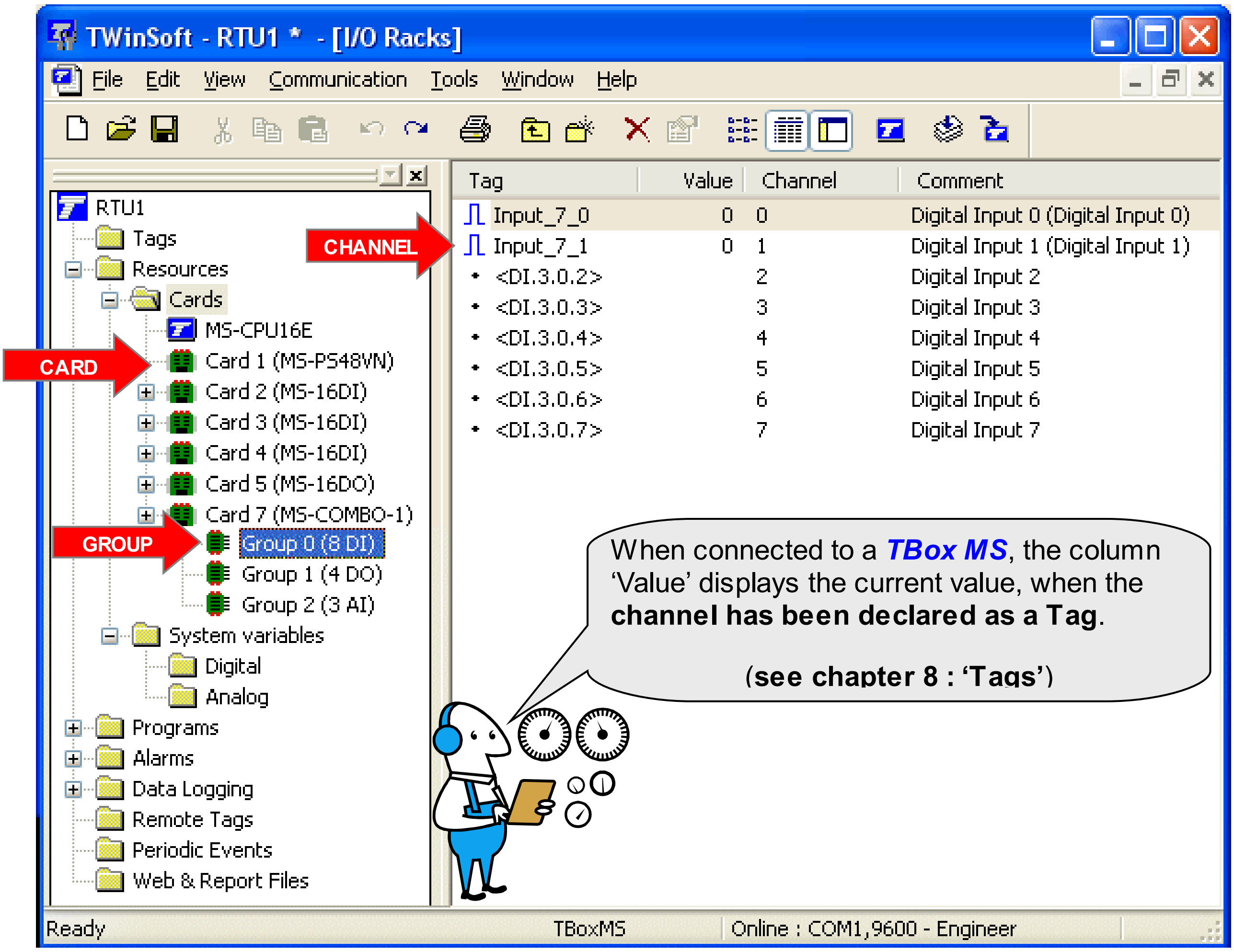


	Name/Id	Type	Comm. Port	Address
	Add an I/O Card			
1	MS-CPU16E	MS-CPU16E	Local	0
2	Card 1	MS-PS230V	Local	1
3	Card 2	MS-16DI	Local	2
4	Card 3	MS-16DI	Local	3
5	Card 4	MS-16DI	Local	4
6	Card 5	MS-16DO	Local	5
7	Card 6	MS-COMBO-1	Local	6

7.2.1. Adding an I/O card

The Hardware is represented in TWinSoft with a hierarchy of 3 levels:

- CARD : **CPU** card, **16 DI** card, **COMBO** card, **Modem** card, …
- GROUP : when there are several types of I/O on a card, they are separated into groups: **group of DI**, **group of DO**, **group of AI**, …
- CHANNEL : each **physical connection**, within a group, corresponds to a channel.



Tag	Value	Channel	Comment
Input_7_0	0	0	Digital Input 0 (Digital Input 0)
Input_7_1	0	1	Digital Input 1 (Digital Input 1)
• <DI.3.0.2>		2	Digital Input 2
• <DI.3.0.3>		3	Digital Input 3
• <DI.3.0.4>		4	Digital Input 4
• <DI.3.0.5>		5	Digital Input 5
• <DI.3.0.6>		6	Digital Input 6
• <DI.3.0.7>		7	Digital Input 7

When connected to a ***TBox MS***, the column 'Value' displays the current value, when the **channel has been declared as a Tag**.

(see chapter 8 : 'Tags')

When adding a Card, its **ID number** must correspond to its position in the Rack. Check the **slot index written in the Rack.**

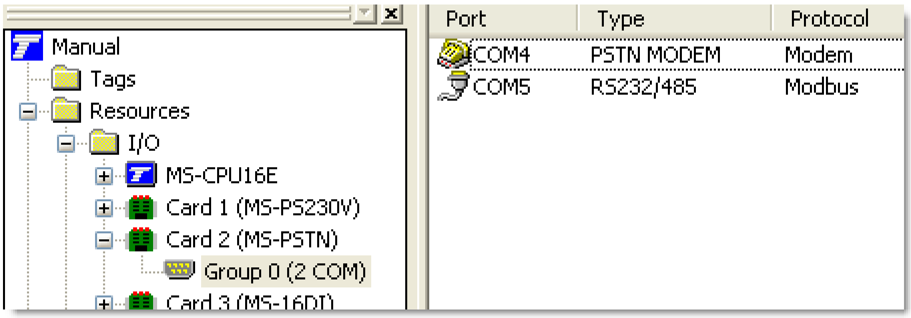
See examples in the manual "*TBoxMS – Technical Specifications*", chapter 3.4.

See also technical details on I/O cards in the manual ***"TBox-MS technical specifications".***

7.2.2. Adding a PSTN Modem Card

A modem card (PSTN or GSM) is composed of a modem and a serial port (RS232 or RS485). Technical specifications are available in the manual ***"TBox-MS technical specifications"***.

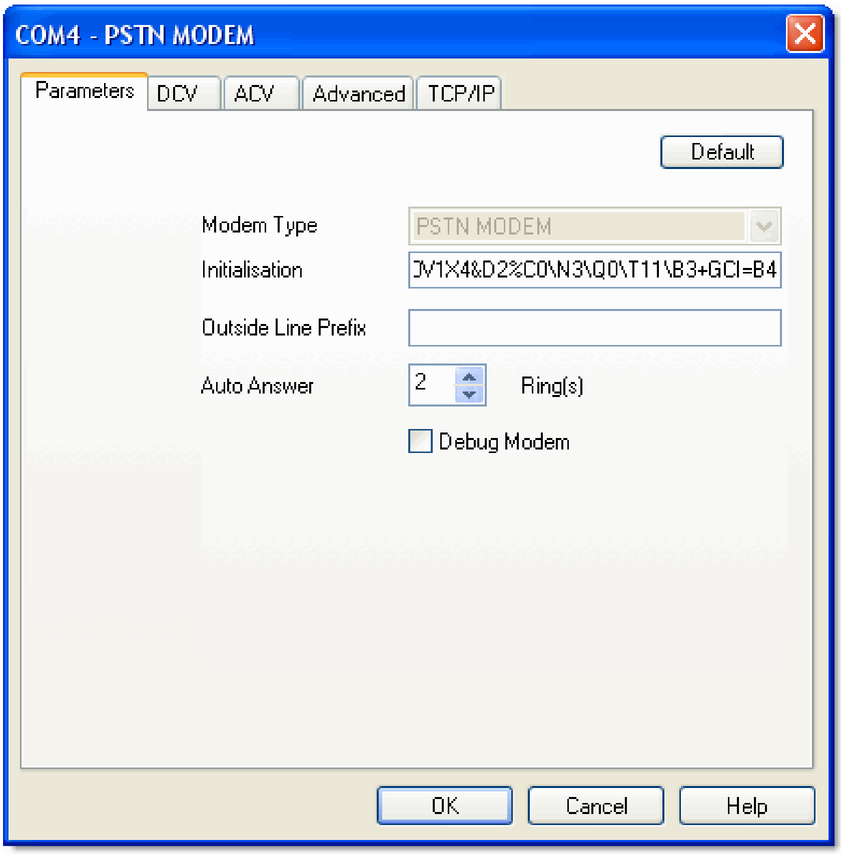
Once created, a 'modem' provides a **Group 0** with communication ports.


Manual
Tags
Resources
I/O
MS-CPU16E
Card 1 (MS-PS230V)
Card 2 (MS-PSTN)
Group 0 (2 COM)
Card 3 (MS-16DI)

Port	Type	Protocol
COM4	PSTN MODEM	Modem
COM5	RS232/485	Modbus

The numbering of communication ports starts at **COM4** or **COM5**, according to the ports available in the CPU. The numbering is **automatically incremented** at each insertion of a communication card.

To enter the **configuration of the modem**, double click the 'modem' port in 'Group 0'



Modem Type: PSTN MODEM
Initialisation: JV1X4&D2%C0\N3\Q0\T11\B3+GCI=B4
Outside Line Prefix:
Auto Answer: 2 Ring(s)
□ Debug Modem

Example with COM4 – PSTN modem

Modem type: It cannot be changed. It corresponds to the modem of the card.

Initialization: The initialization string is sent at power up of the modem and after each connection.
You should not change it, but if changed, **it is saved in the TWinSoft document**.

Outside line prefix: if *TBox MS* is placed behind a telephone switch (PABX), it is the number to get the outside line. **This prefix will be applied automatically** each time *TBox MS* dials out.

Default Initialization and prefix can be modified from the file 'ModemProfiles.xml'.
Changes will be applied to all new document created.

Auto Answer: Number of rings after which the modem will go off hook.

Debug Modem: (working with MS-CPU16).
Allows displaying all communication flowing through the modem. Very useful to debug a communication (see details in Appendix G.1.)

- **Tab DCV: Digital Communication Variables**
  Dedicated variables, with a pre-defined function (communication error, modem online, …) (see chapter 7.3).

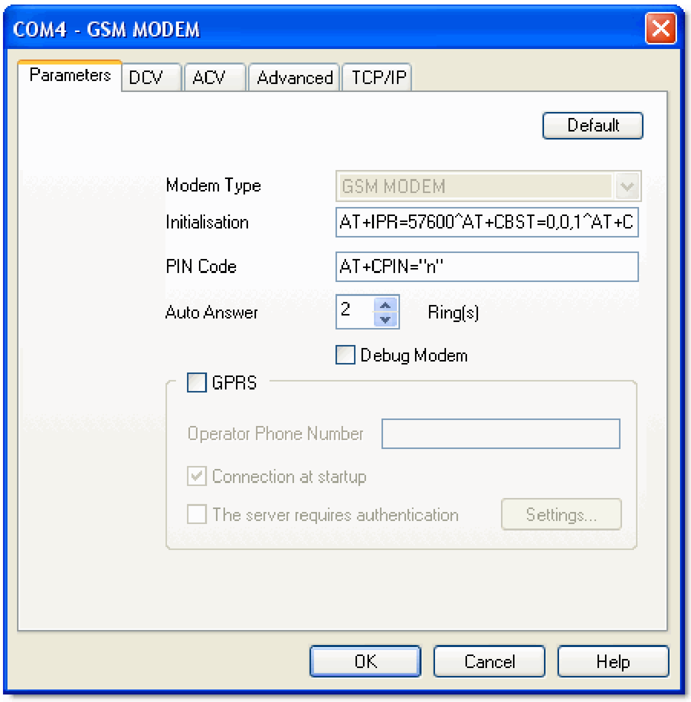
- **Tab ACV: Analog Communication Variables**
  Dedicated variables, with a pre-defined function (time-out, user ID, …) (see chapter 7.3).

- **Tab Advanced**
  Mainly 'timing' parameters required when modem is 'Master' or 'Slave' in a ModBus communication.

7.2.3. Adding a GSM / GPRS modem Card

In addition to configuration described above, a GSM modem can be used in 2 modes:

- as a **GSM data** modem
- in **GPRS** mode



COM4 - GSM MODEM

Modem Type: GSM MODEM
Initialisation: AT+IPR=57600^AT+CBST=0,0,1^AT+C
PIN Code: AT+CPIN="n"
Auto Answer: 2 Ring(s)
☐ Debug Modem
☐ GPRS
Operator Phone Number:
☑ Connection at startup
☐ The server requires authentication Settings...

In addition to the standard modem configuration, some parameters are specific to GSM.

The main option 'GPRS' determines the working mode of the card:

GSM data **OR** GPRS

Debug Modem: (working with MS-CPU16).
Allows displaying all communication flowing through the modem. Very useful to debug a communication (see details in Appendix G)

GSM-data settings

Initialization: should not be changed

PIN Code: If the SIM card you have inserted uses a PIN code, type it at the place of the letter **n**.

Example: with the PIN code 4896, you should have in the field: AT+CPIN="4896" **including the quotes**

If the SIM card you have does not require a PIN code, you can leave the field as it is or erase it completely.

If you type the wrong PIN code, or you type a PIN code when the SIM card does not require one, there is a risk of blocking the SIM card.
It must then be restored with the PUK code using a mobile.

Auto Answer: number of RINGS before the modem picks-up the line.

Dialing to a GSM-data

The SIM card of a GSM has three telephone numbers: VOICE (the one you use to speak), DATA and FAX.
To dial *TBox MS*, you have to be sure that **data service has been activated** and you dial the **DATA number** (please call your GSM operator).

In some countries, like in US for instance, GSM operators do not provide GSM-DATA service.
DATA communication is then only available in GPRS mode (see below)

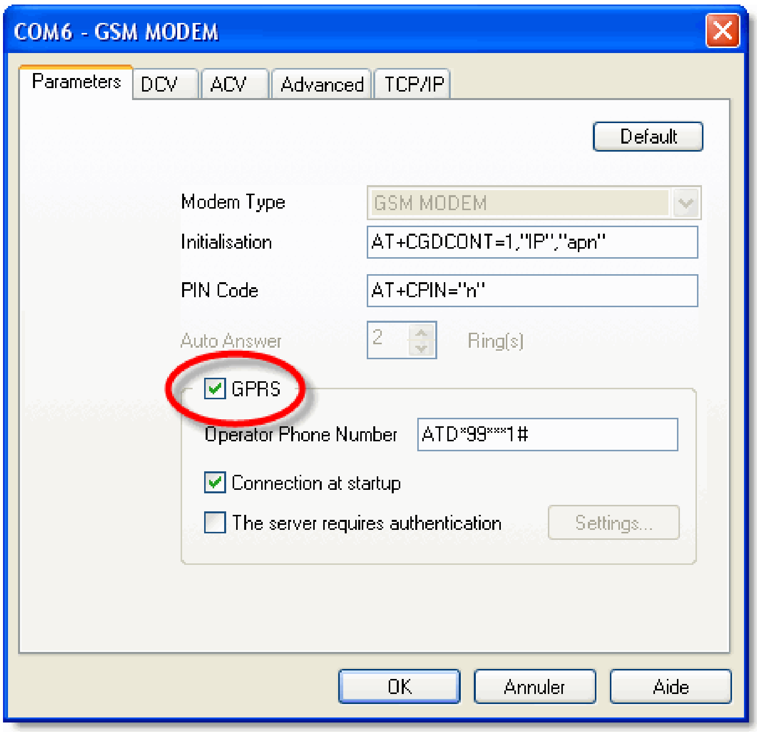
About sending e-mail or Files with GSM-data

Some ISP requires **specific telephone number** for connecting through GSM (please check with your ISP).

GPRS settings

Once you have declared a MS-GSM card, you have to activate the GPRS mode.

You have to choose either 'GSM-Data' mode **OR** 'GPRS' mode. It is not possible to use the modem in both modes at the same time, but it is possible to combine GPRS mode and sending of SMS (see below).



COM6 - GSM MODEM

Modem Type: GSM MODEM

Initialisation: AT+CGDCONT=1,"IP","apn"

PIN Code: AT+CPIN="n"

Auto Answer: 2 Ring(s)

☑ GPRS

Operator Phone Number: ATD*99***1#

☑ Connection at startup

☐ The server requires authentication

When selecting **GPRS**, TWinSoft automatically adapts Initialization and Operator Phone number fields (see next).

If the connection requires a **login**, select the option 'The server requires authentication'.

If you receive a **fixed IP address**, declare it in 'TCP/IP' tab.

Initialization: You have to add in the initialization string the APN (ask you GSM operator). Replace in the string the **apn** with the URL you receive from your GSM operator.
Example with Mobistar: AT+CGDCONT=1,"IP","WEB.PRO.BE".

PIN Code: If the SIM card you have inserted uses a PIN code, type it at the place of the letter **n**.
Example: with the PIN code 4896, you should have in the field: AT+CPIN="4896", **including the quotes**

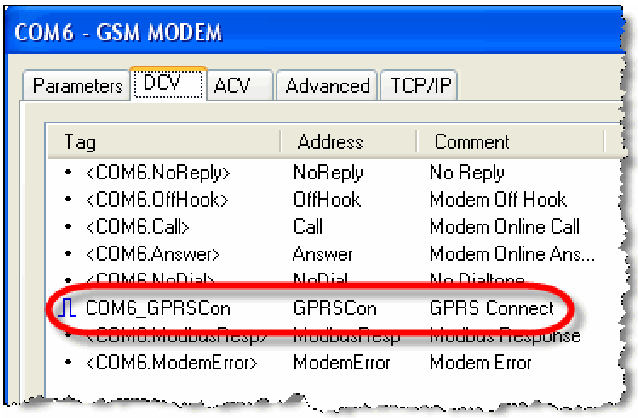
If the SIM card you have does not require a PIN code, you can leave the field as it is or erase it completely.

Operator Phone number: special number to establish the GPRS connection. Typically, the number is ***99***1#**. Check with your operator and type it following the command ATD.
Example with Mobistar, Proximus, SFR, AllIP, …: ATD*99***1#

Connection at start up: when this **option is selected** (by default) ***TBox MS*** handles the modem to keep the connection permanently.
when this **option is removed**, ***TBox MS*** handles the connection according to communication variables: GPRSCon (see below)

Communication Variables dedicated to GPRS

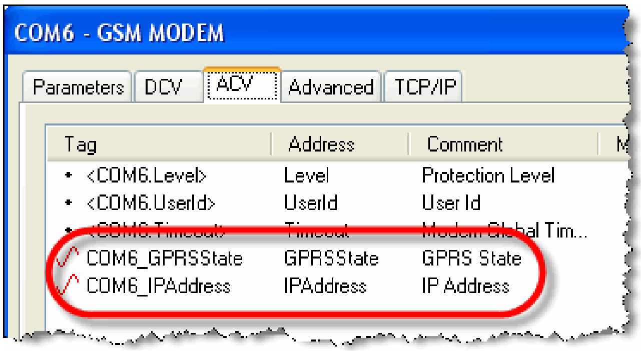
Some communication variables allow manual handling of GPRS and give information on the status.



COM6 - GSM MODEM

Parameters | DCV | ACV | Advanced | TCP/IP

Tag	Address	Comment
• <COM6.NoReply>	NoReply	No Reply
• <COM6.OffHook>	OffHook	Modem Off Hook
• <COM6.Call>	Call	Modem Online Call
• <COM6.Answer>	Answer	Modem Online Ans...
• <COM6.NoDial>	NoDial	No Dialtone
⎍ COM6_GPRSCon	GPRSCon	GPRS Connect
• <COM6.ModbusResp>	ModbusResp	Modbus Response
• <COM6.ModemError>	ModemError	Modem Error



COM6 - GSM MODEM

Parameters | DCV | ACV | Advanced | TCP/IP

Tag	Address	Comment
• <COM6.Level>	Level	Protection Level
• <COM6.UserId>	UserId	User Id
• <COM6.Timeout>	Timeout	Modem Global Tim...
∿ COM6_GPRSState	GPRSState	GPRS State
∿ COM6_IPAddress	IPAddress	IP Address

Digital Communication Variable

COMx.GPRSCon	*	GPRS: Handles the GPRS connection. Working in manual connection, writing '1' forces a connection; writing '0' forces a disconnection. When working with automatic connection, if you reset this variable the connection will stop, but after maximum 5 minutes, it will be automatically restarted. **USE A TRIGGER INPUT CONTACT TO ACTIVATE THE VARIABLE**

Analog Communication Variable

COMx.GPRSState	-	GPRS: indicates the status of the GPRS connection.
		Value=0 : disconnected
		Value=1 : currently connecting
		Value=2 : connected
		Value=3 : currently disconnecting

COMx.IPAddress	-	GPRS: this register gives the IP address used by ***TBox MS*** during its GPRS connection. The information is available in a DWORD, but in the list of Tags, you can display it as an IP address: from the list of Tags, right click the Tag → Display as → IP address. This information is very important **when working with dynamic IP address**. It can be sent for instance by e-mail (see Report Studio), to inform on IP address changing.

About sending alarms with GPRS

With GPRS, you are able to send e-mail or files using FTP. You create recipient(s) associated to the SMTP or FTP server you have associated to the GSM/GPRS.

Working with a manual connection, first the RTU establishes the connection and sends the mail and/or files. Then it stops the connection.
If the connection was already established, the RTU maintains the connection.

Working with an automatic connection, the mail and/or files are sent immediately and the connection is maintained.

For sending e-mail, you need to use the SMTP server specific to the GPRS connection. Ask your GSM operator.

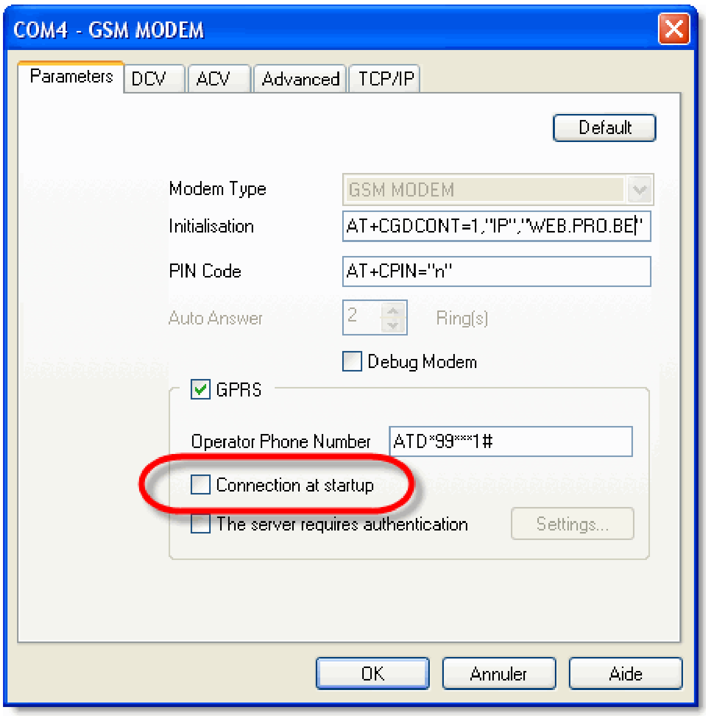
Example with Mobistar: **gprsmail.mobistar.be**

Sending of SMS with GSM configured in GPRS

It is possible, but only with manual connection, **when handling GPRS connection from the Ladder/BASIC logic**.

To use this feature, you have to control the GPRS connection manually:

- Be sure the option '**Connection at startup**' is not activated.
- Make a Tag of the DCV '**GPRSconnect**'
- Change it to **1 to activate GPRS**
- Change it to **0 before sending SMS**



COM4 - GSM MODEM

Modem Type: GSM MODEM

Initialisation: AT+CGDCONT=1,"IP","WEB.PRO.BE"

PIN Code: AT+CPIN="n"

Auto Answer: 2 Ring(s)

□ Debug Modem

☑ GPRS

Operator Phone Number: ATD*99***1#

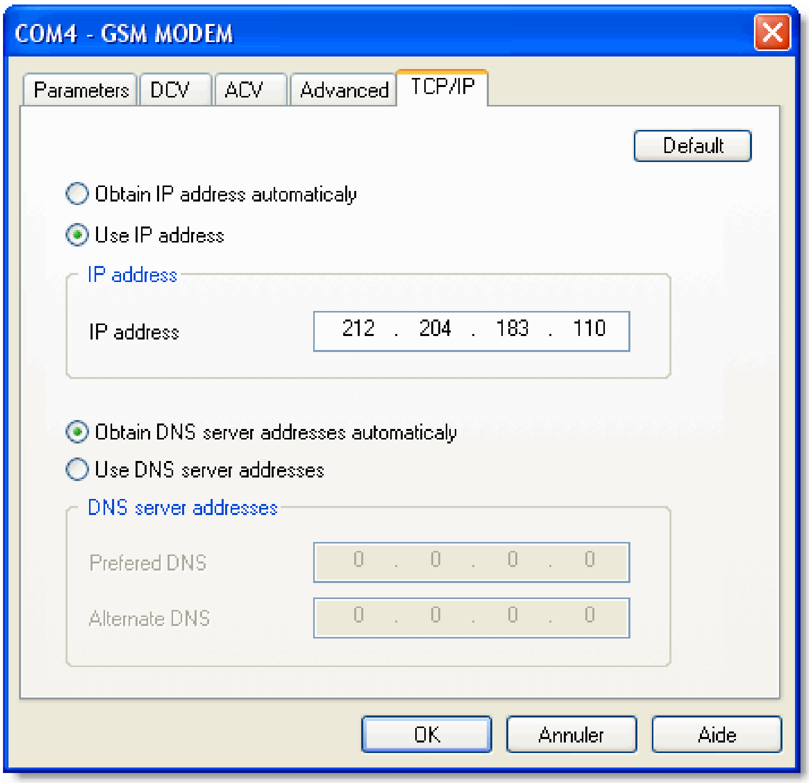
□ Connection at startup

□ The server requires authentication

With this configuration, when de-activating GPRS, it is also possible to use the receive SMS. (See chapter 11: ***Read SMS Embedded***).

GPRS IP settings

GPRS represents a TCP/IP connection using GSM network. It then requires a TCP/IP configuration.



○ Obtain IP address automaticaly

● Use IP address

IP address

IP address: 212 . 204 . 183 . 110

● Obtain DNS server addresses automaticaly

○ Use DNS server addresses

DNS server addresses

Prefered DNS: 0 . 0 . 0 . 0

Alternate DNS: 0 . 0 . 0 . 0

Obtain IP address automatically:
You work with dynamic IP address which is provided by the Operator at the connection.

Use IP address:
You work with fix IP address; it corresponds to the SIM card you use.

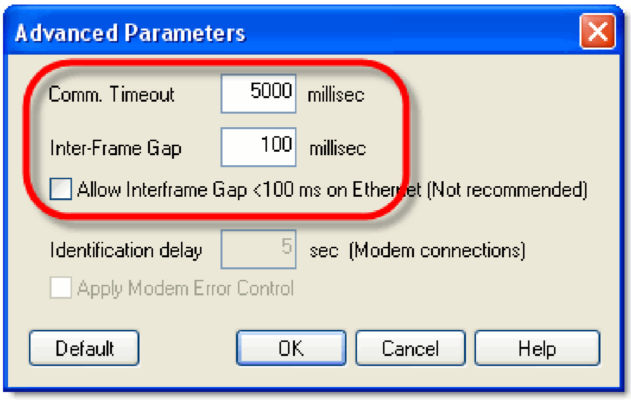
Obtain DNS server addresses auto.:
The Operator provides you with DNS.

Use DNS Server addresses:
You want to use specific DNS addresses.

Using TWinSoft to communicate to a RTU in GPRS

Typically, you will access ***TBox MS*** from a LAN, using an Ethernet connection (if your LAN has a Gateway connection to Internet).

In order to have a reliable communication, you have to increase some timing parameters in TWinSoft: menu 'Communication' → 'PC Setup'; select 'Ethernet' and click 'Advanced'.



Comm. Timeout 5000 millisec

Inter-Frame Gap 100 millisec

□ Allow Interframe Gap <100 ms on Ethernet (Not recommended)

Identification delay 5 sec (Modem connections)

□ Apply Modem Error Control

Change 'Comm. Timeout' to 5000 millisec. or higher

Change 'Inter-Frame Gap' to 100 millisec.

Before **sending a program through GPRS**, check the TCP/IP PC setup settings, like explains chapter 4.3.2. ***IP address settings,*** point 3.

7.3. Communication Variables

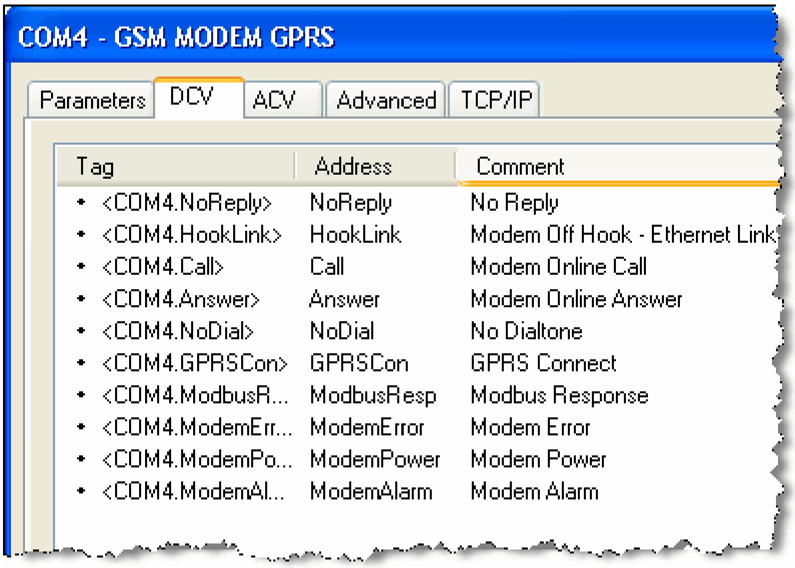
Communication variables are dedicated registers providing different status of the communication.

It is very useful for controlling the connection and the access level authority.

Those variables are divided into 2 tabs, the Digital Communication Variables (DCV) and the Analog Communication Variables (ACV).

When you need one, you double click it from the list and declare it as a Tag. It becomes then available in any feature of ***TBox MS***.

7.3.1. Digital Communication Variable



Tag	Address	Comment
<COM4.NoReply>	NoReply	No Reply
<COM4.HookLink>	HookLink	Modem Off Hook - Ethernet Link
<COM4.Call>	Call	Modem Online Call
<COM4.Answer>	Answer	Modem Online Answer
<COM4.NoDial>	NoDial	No Dialtone
<COM4.GPRSCon>	GPRSCon	GPRS Connect
<COM4.ModbusR...	ModbusResp	Modbus Response
<COM4.ModemErr...	ModemError	Modem Error
<COM4.ModemPo...	ModemPower	Modem Power
<COM4.ModemAl...	ModemAlarm	Modem Alarm

Example with COM4 – GSM modem

According to its function a Communication variable is Read/Write or Read only.

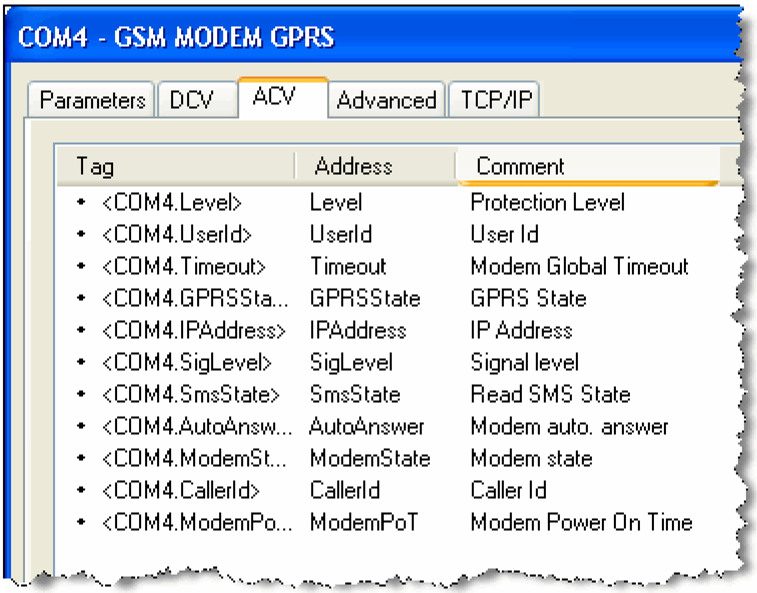
In the following table, the column **R/W** indicates:

–	:	Read only.
0	:	Write '0' only.
1	:	Write '1' only.
*	:	Write '0' or '1'.

Name	R/W	Description
COMx.NoReply	0	Communication: **SET** by ***TBox MS*** in case of communication error. The possible errors are: - Timeout. - ModBus: Unknown address, wrong quantity, CRC error. - TCP/IP: wrong closing of socket. **Must be RESET by the user**.
COMx.HookLink	*	**Modem:** Reading '1': indicates a dial-up modem has picked-up the line and is connecting to another modem. The success of the connection can be checked using the 'Connect' variables (see below). In GPRS mode, the value is maintained at '0'. Writing '0' : forces a hardware reset of the modem. Writing '1' : forces the modem to hangup and a GPRS disconnection. **Ethernet:** Reading '1' : indicates the Ethernet is connected to a device (hub, switch, PC, ...). Writing '0' or '1': forces a reset of the Ethernet chip. Ethernet communication is not interrupted. **USE A TRIGGER INPUT CONTACT TO ACTIVATE THE VARIABLE**

Name	R/W	Description
`COMx.Call`	–	Modem: Reading '1' indicates the modems are synchronized with ***TBox MS*** 'Calling'
`COMx.Answer`	–	Modem: Reading '1' indicates the modems are synchronized with ***TBox MS*** 'Answering'
`COMx.NoDial`	0	Modem: Reading '1' indicates that no dial tone has been detected when the modem has picked-up the line. **Must be RESET by the user**.
`COMx.GPRSCon`	*	GSM: Indicates the status of the GPRS connection. Writing '1' forces a connection; writing '0' forces a disconnection (see above for more details).
`COMx.ModBusResp`	0	Communication: Reading '1' indicates the port is transmitting. At each transmission, ***TBox MS*** **SET** this register. To check ***TBox MS*** is transmitting, **you RESET** this register and test whether it is SET again (using Ladder or BASIC)
`COMx.ModemError`	0	Communication: modem initialization failed. Modem has answered with an ERROR to one of the parameters of the init. String (see modem properties). A reason could be, with GSM, because it is not registered yet. When **you RESET** this register, OS executes a warm start of the modem (sending init. string)
`COMx.ModemPower`	*	LowPower: used only with Low Power RTU
`COMx.ModemAlarm`	*	LowPower: used only with Low Power RTU

7.3.2. Analog Communication Variable



Tag	Address	Comment
<COM4.Level>	Level	Protection Level
<COM4.UserId>	UserId	User Id
<COM4.Timeout>	Timeout	Modem Global Timeout
<COM4.GPRSSta...	GPRSState	GPRS State
<COM4.IPAddress>	IPAddress	IP Address
<COM4.SigLevel>	SigLevel	Signal level
<COM4.SmsState>	SmsState	Read SMS State
<COM4.AutoAnsw...	AutoAnswer	Modem auto. answer
<COM4.ModemSt...	ModemState	Modem state
<COM4.CallerId>	CallerId	Caller Id
<COM4.ModemPo...	ModemPoT	Modem Power On Time

According to its function a Communication variable is Read/Write or Read only.

In the following table, the column **R/W** indicates:

- – : Read only.
- * : Writable.

Example with COM4 – GSM modem

Name	R/W	Description
COMx.Level	*	Access Control: access level of the user currently logged (see chapter 16).
COMx.UserId	*	Access Control: user Id of the user currently logged (see chapter 16). The user Id and the authority level correspond to those you have defined with the utility ' PASSWORD '. The values returns to 0 when the user has disconnected. Values can be written to those registers. *Example:* when a user is connected you can modify its level access by writing a value in the register COMx.level (level available: 0, 1, 2 or 3). Those values can be stored in analog chronology for keeping a history on the access. When a user disconnects (Logout), the register returns to '0
COMx.Timeout	*	Modem: global time-out for hanging-up the modem when there is no communication. Correspond to the 'Inactivity time-out' in the 'Advanced properties' of the modem.

COMx.GPRSState	-	GPRS: indicates the status of the GPRS connection.
		Value=0 : disconnected
		Value=1 : currently connecting
		Value=2 : connected
		Value=3 : currently disconnecting
		(see above for more details)

COMx.IPAddress	-	GPRS: this register gives the IP address used by ***TBox MS*** during its GPRS connection. The information is available in a DWORD. It can be displayed in the list of Tag as 'IP address' (see context menu on the Tag → 'Display as…').
COMx.SigLevel	-	GSM: The quality of the GSM signal. The range of the value is 1 to 31. The value should be minimum 18 to be considered as an acceptable signal level. PSTN: Voltage on the line (+/- 20%)
COMx.SmsState	-	GSM: associated to the GSM, can be used to check the status of ReadSMS (see chapter 11.).
COMx.AutoAnswer	*	Modem: Read: indicates the number of RING before the off hook Write "0": no off hook Write "1": force off hook at the next RING
COMx.ModemState	-	MODEM: gives current status of the modem. Possible values are: 1: PIN code sent (GSM only when PIN code activated) 2: Wait after PIN code is sent 4: Init string accepted 7: Idle mode 9: Calling. Waiting CONNECT 10: RING arriving 11: Answering. Wait CONNECT The last value is maintained, until the next status changing.
COMx.CallerID	*	MODEM: variable which indicates the caller ID of the current incoming modem connection, 32 bits format, giving the 9 last digits of the calling number. It can be used in the program to trace and control who is calling Init string of GSM modem: Caller ID identification must be activated. Add at the end of the init string of **MS-GSM**: ^AT+CLIP=1
COMx.ModemPoT	*	LowPower: used only with Low Power RTU

7.4. System variables

The system variables have pre-defined functions.
They are very useful to check or to act on features of ***TBox MS***.

They are divided into 'Digital' and 'Analog'.

7.4.1. Digital System Variables

According to its function a register is Read/Write or Read only. In the following table, the column R/W indicates:

-	:	Read only.
0	:	Write '0' only.
1	:	Write '1' only.
*	:	Write '0' or '1'.

When the action **(SET)** is specified, it means that the ***TBox MS*** maintains the variable at 1 to be sure it is detected. With such a variable, **you need then to reset it using Ladder/BASIC** logic.

Index	**Name**	**R/W**	**Description**
0	TikSec	0	Tik Second: Changes of state every second. Useful for counting time.
1	PrgRun	-	Program run: At each starting of ***TBox MS*** , this register changes to 1 and stays at 1 as long as the BASIC/Ladder program runs. This register is used in BASIC/Ladder to execute operations only at the start of the program, with the help of a positive edge trigger function.
2	NewPro	-	New program: Start of a program flag. Changes to 1 if ***TBox MS*** has started after having received a new program. Changes to 0 after a reset of the ***TBox MS***.
3	Reboot	1	Reboot: complete restart of ***TBox MS***. It is equivalent to hardware reset.
4	RstWat	*	Reset Watchdog: the watchdog checks the cycle time of BASIC/Ladder program. In case it is longer than 1 second, it resets ***TBox MS***. This Watchdog can be reset to reinitialize the 1 second timer in case of cycle time longer.
5	Ala_On	0	Alarm on: this register indicates that alarm is active (not ack.). Writing 0 in this register causes a global acknowledgment of all alarms. Corresponds to a reset of the Alarms stack
6	Alaerr	0	Alarm in error: ***TBox MS*** SETs this register when an alarm failed to be sent. This means that after the number of tries, the alarm has been auto-acknowledged. **Must be RESET by the user**.
7	RstAla	1	Reset Alarm: Not used. See 'Ala_On' above.
8	EnaDCr	*	Chronology: General enable of recording in digital chronology.
9	EnaACr	*	Chronology: General enable of recording in analog chronology.
10	EnaSam	*	Sampling Tables: General enable of recording in sampling tables (not available yet).
11	EnaAla	*	Enable Alarm: General enable of generating alarms.
12	DisCrd	*	Chronology: flag that can be associated to any digital chronology configuration to inhibit recording. When at value '1', inhibits recording in Database.
13	DisCra	*	Chronology: flag that can be associated to any analog chronology configuration to inhibit recording. When at value '1', inhibits recording in Database.

Index	Name	R/W	Description
13	DisCra	*	Flag analog chronology: can be associated to any analog chronology configuration to inhibit recording. When at value '1', inhibits recording in Database.
14	DisSam	-	(Not used)
15	DisAla	-	Alarm: flag that can be associated to any Alarm condition. When associated to an alarm condition and at value '1', the sending of alarm is inhibited.
16	DaySav	-	Time: 1 = summer time (the ASPE ZoneBias = + 3600 seconds). 0 = wintertime.
17	PrgEnb	*	Program Enable: when reset to '0', allows stopping the execution of BASIC/Ladder program. It can be useful to execute the program manually (see next).
18	PrgOnc	1	Program Once: when set to '1', executes the cycle of BASIC/Ladder program once. Useful for debugging the program. ***TBox MS*** resets the variable automatically.
19	TcpIpLog	*	TCP Logging (MS-CPU16): Setting this register activates the Debugging of TCP/IP connection. Very useful to trace problems when sending e-mail or FTP. (see appendix G.2.) When this option has been activated, the information is available from TWinSoft main menu: 'Communication' → 'Download' → 'TCP/IP debugging'.
20	ALAovf	*	Alarm Overflow: overflow in the stack of alarms. The size of the stack of alarms can be adjusted from the 'Advanced' properties of the RTU
21	ComErr	0	Communication error: general communication error flag. It means that one of the communication port (of the CPU or of a communication card) used as 'Master' has encounter a communication error. **(SET)**
22	SmtpEr	0	Smtp Error: an error occurred while sending an e-mail. **(SET)**
23	FtpErr	0	Ftp Error: an error occurred while sending files. **(SET)**
24	NTPErr	0	NTP Error: an error occurred while setting time of ***TBox MS***. **(SET)**
25	GpsVF	0	GPS: GPS validity. GPS returns a valid signal. Validity of the signal. When changes to one, it indicates the GPS receives sufficient signals to calculate its position (from minimum 3 satellites). When changing from 0 to 1, the time of ***TBox MS*** is set to the time of GPS, with correction in regards to GMT according to the location of TBox. If you want to update the time manually, you reset the variable
26	GPRSErr	0	GPRS Error: an error occurred during GPRS connection. ***TBox MS*** does not succeed to connect (**not supported yet**) **(SET)**
27	ModemLog	*	ModemLog: authorizes the modem connection to be logged into chronology. The communication port is declared in the ASV.24 [PortIdLog]. **The ASV.25 [EventLog] must be tagged also.** The information is available in from the communication → Download → TraceLog (not supported yet)
28	SystemEr	0	SystemErr: the RTU detected an error during starting. Typically a problem with a card which is default or a discordance between cards detected in program and cards installed. **(SET)**
29	MmcToRTU	-	MMC: indicates whether the program has been loaded from the MMC **1** = the program of the MMC is different from the one of the RTU and has been loaded from the MMC **0** = there is no MMC; the MMC is empty; the program of the MMC is identical to the one of the RTU (see also appendix C. ***Plug&Go***)
30	DigChrOv	-	Chronologies: Indicates that the amount of records in the digital chronology has reached the maximum selected
31	AnaChrOv	-	Chronologies: Indicates that the amount of records in the analog chronology has reached the maximum selected

Index	Name	R/W	Description
32	RsDigChr	1	Chronologies: Allows emptying the digital chronology using a SET. Automatically reset by OS
33	RsAnaChr	1	Chronologies: Allows emptying the analog chronology using a SET. Automatically reset by OS
34	BusError	-	Bus : When an error is detected the variable changes to 1. The LED error on the CPU is switched ON until hardware reset. In parallel, we reinitialize the TBox MS cards every second An error on the Bus might happen if the earth of RTU is not good. **EMC protection is very good with TBox, but requires a very good connection to earth.**
35	MasterAnsw	*	Remote Tag: when set to 1, allows handling of remote Tags on **incoming call**. It concerns then only **Remote Tags through modem**
36	DynDnsEr	0	TCPIP: error during a connection to DynDNS server. **(SET)**
37... 44	Tsl_Xa	-	Alarm: There are 8 time slices that can be used to build Time Tables. Those 8 variables indicate the activity of each of them
45	DisAla2	*	Alarm: second flag that can be associated to any Alarm condition. When associated to an alarm condition and at value '1', the sending of alarm is inhibited.
46	DisAla3	*	Alarm: third flag that can be associated to any Alarm condition. When associated to an alarm condition and at value '1', the sending of alarm is inhibited.
47	DisAla4	*	Alarm: fourth flag that can be associated to any Alarm condition. When associated to an alarm condition and at value '1', the sending of alarm is inhibited.
48	POP3Err	0	POP3 Error: an error occurred while reading an e-mail. **(SET)**

7.4.2. Analog System Variables

According to its function a variable is Read/Write or Read only. In the following table, the column R/W indicates:

- : Read only.
* : Writable.

Index	Name	R/W	Description
0	Second	*	Time: current "Second" in ***TBox MS***
1	Minute	*	Time: current "Minute" in ***TBox MS***
2	Hours	*	Time: current "Hour" in ***TBox MS***
3	Day	*	Time: current "Day of the month" in ***TBox MS***
4	Month	*	Time: current "Month" in ***TBox MS***
5	Year	*	Time: current "Year" in four digit in ***TBox MS***
6	DayOfw	*	Time: current "Day of the week" in ***TBox MS*** (Mo=1; Tu=2; We=3; ...)
7	AlaCnt	-	Alarm quantity: Amount of alarms in the alarms stack. It means the quantity of alarms that have not been generated already. The size of the Alarm stack can be adjusted in the 'Advanced RTU properties').
8	AlaID	-	Alarm last index: Absolute index of the last alarm generated (number between 0 and 65535).

Index	Name	R/W	Description
9	ALACur	-	Alarm current index: Absolute index of the alarm being currently handled (number between 0 and 65535). Can be used **to acknowledge** an alarm by writing its index.
10	ALARec	*	Alarm recipient: gives the index of the recipient of the current alarm. Can be used **to acknowledge** all alarms of a Recipient by writing its index (see index in the list of Recipient).
11	SamQty	-	Sampling Table: Quantity of sampling tables defined.
12	UtcTim	-	Time: Universal Coordinated Time (UTC). It is the number of seconds since 01/01/1970, GMT time. It is used as time-stamp reference for datalogging.
13	ZonBia	*	Time: Time difference in seconds with GMT.
14	ZonID	*	Time: ID of the zone where ***TBox MS*** has been installed. It uses Regional Settings of PC, therefore **it is important that you configure PC according to the location where *TBox MS* is installed.**
15	WeYear	*	Time: week of the year. * See note below.
16	CycTim	*	Time: time for one cycle of the program (BASIC and Ladder). This register is refreshed after each cycle. Within the program, you could compute this register to memorize the highest value.
17	AAcond	-	Alarms: Quantity of alarm conditions, which are still active.
18	LevId	-	Events: absolute number of the last event (0…65535).
19	AppVer	-	Application version: according to the 'version' indicated in the 'Info' of the RTU properties. This register returns a version in a WORD format: 0…65535
20	OsVer	-	Operating System version: running in ***TBox MS***
21	OsBuil	-	Operating System: build number of the OS running in ***TBox MS***
22	LoaVer	-	Loader version: Loader version running in ***TBox MS***
23	LoaBui	-	Loader build: build number of the loader running in ***TBox MS***
24	PortIdLog	*	TCP Logging (MS-CPU16): selection of the port for TCP debugging (see appendix G.2.)
25	EventLog	-	TCP Logging (MS-CPU16): contains internal codes used for TCP debugging.(see appendix G.2.)
26	MilliS	-	TIME: With CPU-16: 10 milliseconds tik With CPU-32: 1 millisecond tik (not available yet)
27	GpsLat	-	GPS: current latitude given by the MS-GPS. Latitude in degrees multiplied by 1000000 (example: 50123456 means 50 degrees + 0.123456 degree). Resolution : 11 cm. Precision 15 meters
28	GpsLong	*	GPS: current longitude given by the MS-GPS. Longitude in degrees multiplied by 1000000 (example: 7123456 means 7 degrees + 0.123456 degree). Resolution : 11 cm. Precision 15 meters
29	GpsAlt	-	GPS: current altitude given by the MS-GPS. Altitude in meters. Resolution, 1 meter. Precision: depends on the quantity of satellites. Poor precision
30	GpsSats	-	GPS: quantity of satellites detected by the MS-GPS. Must be of minimum 3, or even 4 to expect a good precision.
31	ReRout	*	Modbus: variable 16 bits, each representing a COM Port from 1 to 16. The bits corresponding to the Ports in ReRouting are at 1, the other at 0. Can be use to set the mask.

Index	Name	R/W	Description
32	`MasterEr`	*	Communication: indicates the last station ID (modbus address) in communication error. Once an error has been detected, the value is maintained until next error. Usually, communication errors can be solved by modifying the time-out available in the 'Advanced' tab of the communication used (End of Fame Detection, IFG, Rx Time-out). To trace error, we advise you to reset the variable and check it when it is different from 0. When this happens, you can handle it in your process and reset the variable, that it is ready for the next error.
33	`CardErr`	*	System: this variable indicates card(s) in error. Each bit of the variable corresponds to a card: bit 0 = CPU bit 1 = card 1 ... The test is carried out at the starting of ***TBox MS*** and it indicates discordance between cards declared in TWinSoft and cards placed on the Rack (card(s) not present or different).
34	`CPUusage`	-	Low Power: Not available with ***TBox MS***. Used with Low Power RTU only
35	`SerialNb`	-	Hardware: indicates the serial number of the CPU (see sticker on the side of the card).
36	`CPUmode`	-	CPU Redundancy: indicates the current operation mode of the CPU: - 0 : Standalone - 1 : Primary active (default) - 2 : Primary disconnected - 3 : Backup passive - 4 : Backup active - 5 : Backup disconnected
37	`OpenSock`	-	TCP/IP: number of sockets opened. The socket availability is: - 1 socket reserved for Remote Tags 'Client' - 2 sockets reserved for 'Alarms (FTP needs 2 sockets) - 5 sockets available for 'Server' connection
38	`GpsSpeed`	-	GPS: with a GPS on TBox, current speed of TBox, expressed in km/h
39	`GpsRoute`	-	GPS: with a GPS on TBox, current direction of TBox, expressed in degree (0 .. 359.9 degree)
40	`AlaPop3`	-	Alarm: it indicates the number of alarm needing to be acknowledged by POP3 connection
41	`EvenCur`	*	Alarm: it indicates the current Event ID
42	`HardRev`	-	HW: it indicates the hardware revision of the CPU
43	`Pop3State`	*	Alarm: indicates the state of POP3 connection. Particularly useful when monitoring the RTU with POP3 connections. The last value is maintained: 1 Accepted message received 2 Acknowledgment received 10 Invalid message 11 Unknown command 20 Incorrect password 21 Incorrect password or not supplied for a com. Port protected 30 Message received does not match a pre-defined message

(*) System variable 15. 'Week of the year' :

This system variable indicates the week of the year according to the date in the RTU.

The rules are the following:

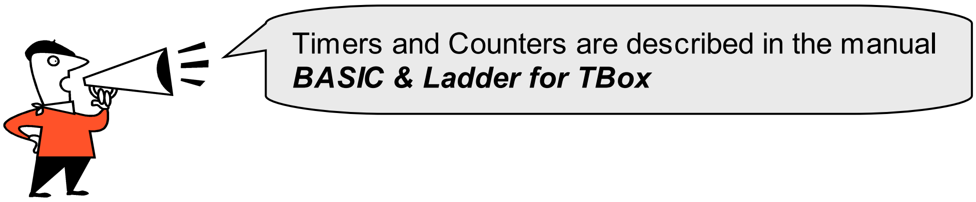
- the changing of week happens on Monday, 00:00 AM
- the changing of week happens at January, 1 whatever day it is
- if January, 1 is as Friday, Saturday or Sunday, there will be two 'Week 1'

Examples:

Month	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Week
dec	..	..	..	17	18	19	20	50
dec	21	22	23	24	25	26	27	51
dec / jan	28	29	30	31	1	2	3	52 / 1
jan	4	5	6	7	8	9	10	1
jan	11	12	..	..	..			2

Month	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Week
dec	..	..	..	18	19	20	21	50
dec	22	23	24	25	26	27	28	51
dec / jan	29	30	31	1	2	3	4	52 / 1
jan	5	6	7	8	9	10	11	2
jan	12	13	..	..	..			3

7.5. Timers & Counters


Timers and Counters are described in the manual
BASIC & Ladder for TBox

8. Tags

A Tag is essential for any programming

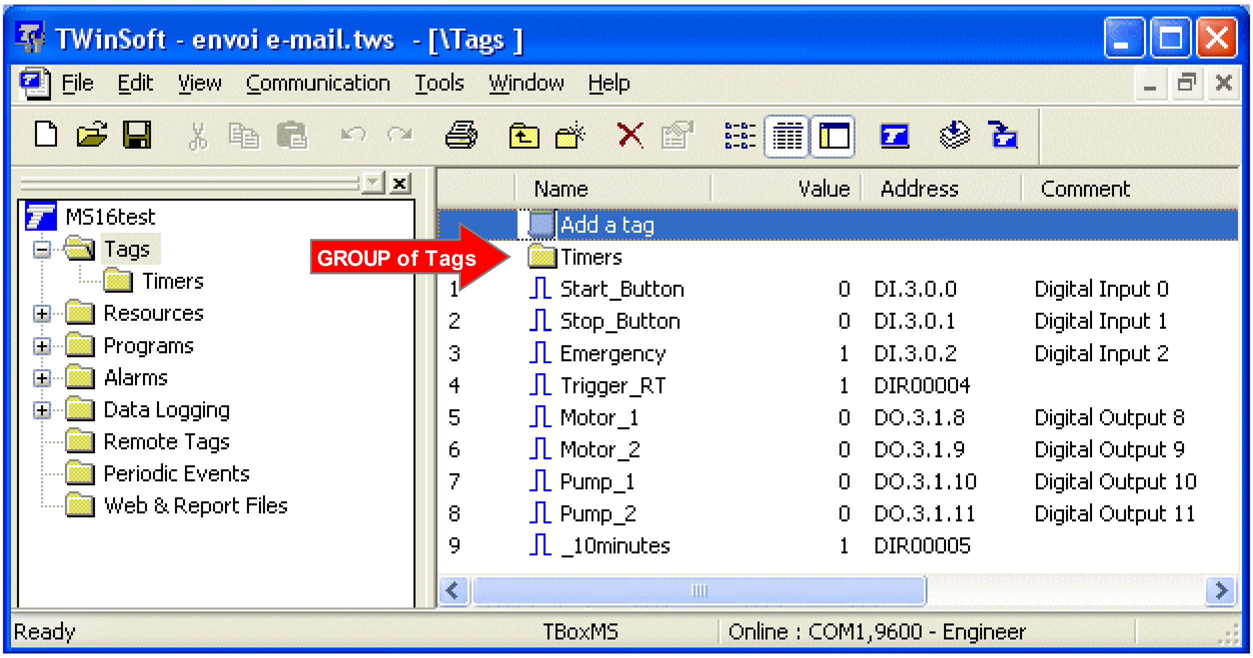
- An alarm is conditioned from a Tag.
- The Datalogging mechanism records values of Tags.
- BASIC/Ladder logic executes a process by handling Tags.
- …

***Any variable** of the **TBox MS** that you want to use in any configuration **has to be declared as a Tag**.*

There are **4 types of variables**:

- The **Physical I/O** (DI, DO, AI, AO)
- The **System Variables** (predefined analog and digital functions)
- The **Internal variables**, digital, analog and Text (aka Registers)
- The **Communication Variables**, digital and analog

The Tags are gathered in the folder **Tags** of the Project Workspace:



	Name	Value	Address	Comment
	Add a tag			
	Timers			
1	Start_Button	0	DI.3.0.0	Digital Input 0
2	Stop_Button	0	DI.3.0.1	Digital Input 1
3	Emergency	1	DI.3.0.2	Digital Input 2
4	Trigger_RT	1	DIR00004	
5	Motor_1	0	DO.3.1.8	Digital Output 8
6	Motor_2	0	DO.3.1.9	Digital Output 9
7	Pump_1	0	DO.3.1.10	Digital Output 10
8	Pump_2	0	DO.3.1.11	Digital Output 11
9	_10minutes	1	DIR00005	

The Tags can be sorted into **Groups of Tags**.

From the list of Tags, right click.
From the Context menu, select 'New → Group'.
You can then move/create Tags into the Group.

8.1. Physical I/O

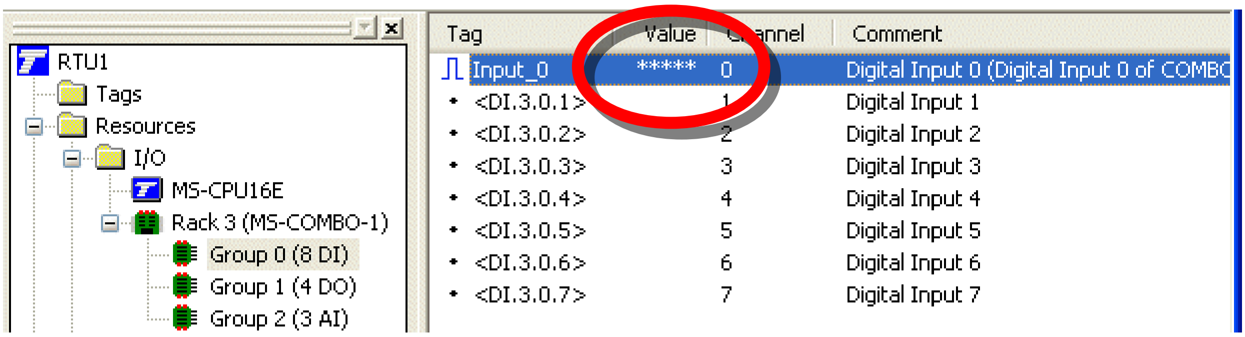
The physical I/O's are the signals available on I/O cards. They can be easily accessed from the 'Resources' (see chapter 7: *'**The Resources**'*)

To create a Tag of a variable from the Resources:

- select it into the list and double click it
- change its name and description
- click <OK>

If you are connected to a ***TBox MS*** when the Tag is created, you will see ***** appearing in the column 'Value'.
This is because the **ModBus address of the Tag** needs to be sent to ***TBox MS*** (see chapter 8.3: '***ModBus addresses***')

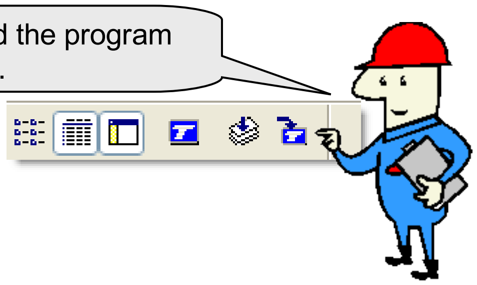
Once the program has been sent, the value appears.

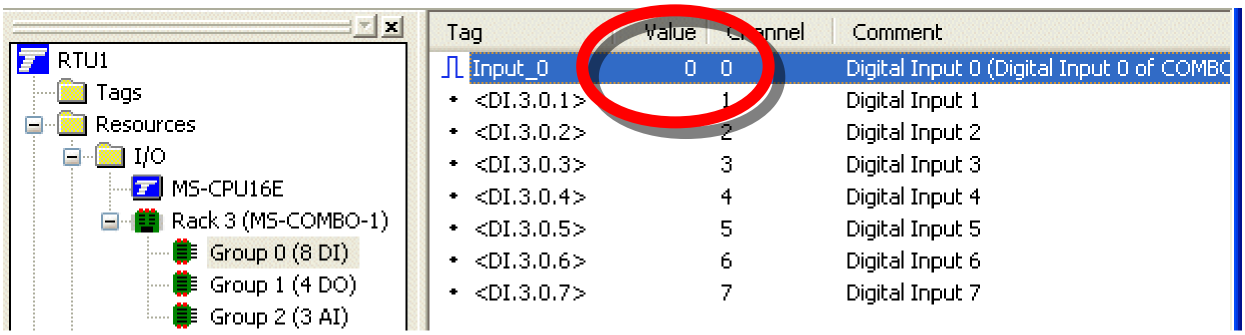


RTU1
- Tags
- Resources
  - I/O
    - MS-CPU16E
    - Rack 3 (MS-COMBO-1)
      - Group 0 (8 DI)
      - Group 1 (4 DO)
      - Group 2 (3 AI)

Tag	Value	Channel	Comment
Input_0	*****	0	Digital Input 0 (Digital Input 0 of COMBO
<DI.3.0.1>		1	Digital Input 1
<DI.3.0.2>		2	Digital Input 2
<DI.3.0.3>		3	Digital Input 3
<DI.3.0.4>		4	Digital Input 4
<DI.3.0.5>		5	Digital Input 5
<DI.3.0.6>		6	Digital Input 6
<DI.3.0.7>		7	Digital Input 7

You can send the program with this icon.





RTU1
- Tags
- Resources
  - I/O
    - MS-CPU16E
    - Rack 3 (MS-COMBO-1)
      - Group 0 (8 DI)
      - Group 1 (4 DO)
      - Group 2 (3 AI)

Tag	Value	Channel	Comment
Input_0	0	0	Digital Input 0 (Digital Input 0 of COMBO
<DI.3.0.1>		1	Digital Input 1
<DI.3.0.2>		2	Digital Input 2
<DI.3.0.3>		3	Digital Input 3
<DI.3.0.4>		4	Digital Input 4
<DI.3.0.5>		5	Digital Input 5
<DI.3.0.6>		6	Digital Input 6
<DI.3.0.7>		7	Digital Input 7

8.2. *Internal Variables (Registers)*

An internal variable (also know as Register) is an addressable location of the memory. It is used as flag, as temporary value, to make a calculation, …

There are 2 types of internal variables:

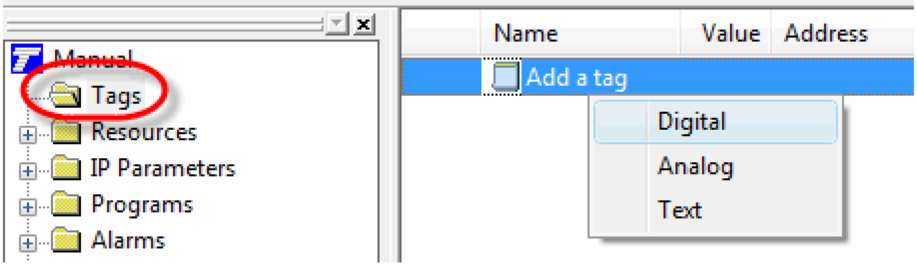
- **Digital (DIV)** Boolean register with possible values: 0 or 1.
- **Analog (AIV)** with several formats:
  - 8 bits, Signed or Unsigned
  - 16 bits, Signed or Unsigned
  - 32 bits, Signed or Unsigned
  - Float, IEEE 754
- **TEXT (AIV)** analog register associated to a string of characters

The Internal Variables can be only created from the list of Tags.

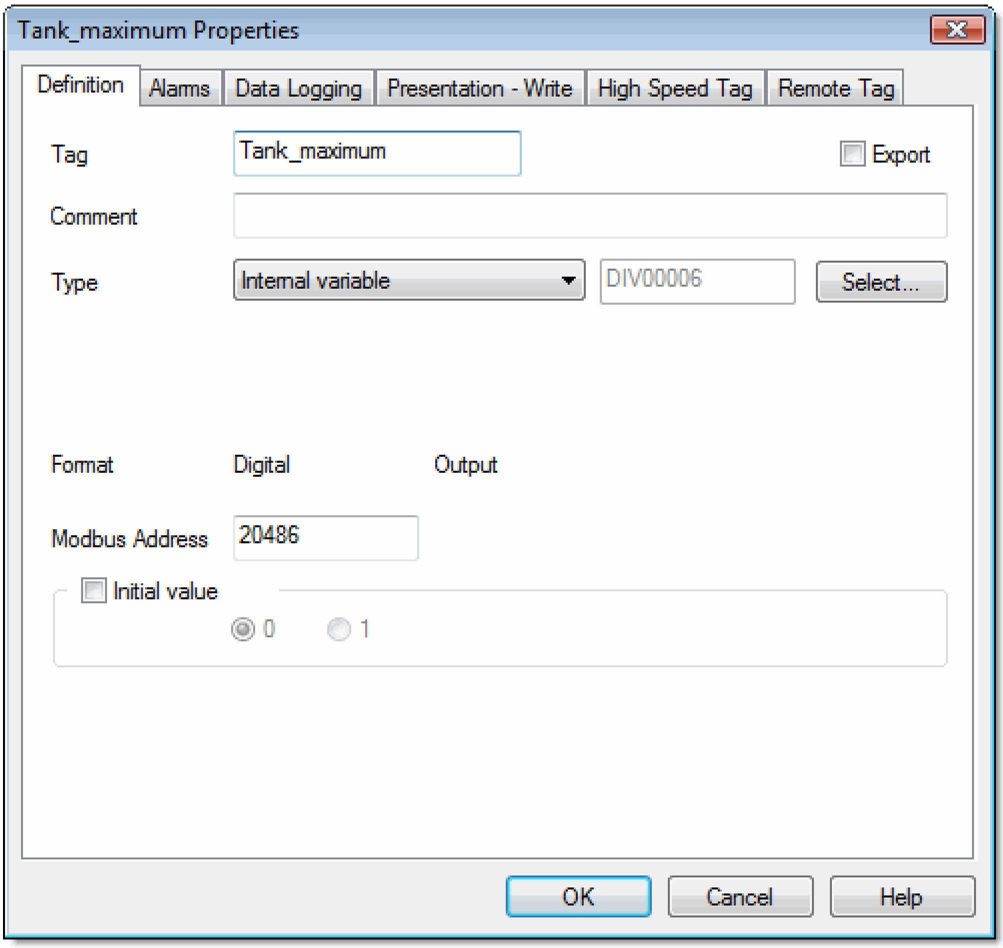
8.2.1. Digital Internal Variable

To create a Digital Internal Variable, from the list of Tags, click '*Add a Tag*'.

Select *'Digital'*



The Definition menu pops up:



Tank_maximum Properties

Tag: Tank_maximum

□ Export

Comment:

Type: Internal variable DIV00006

Format: Digital Output

Modbus Address: 20486

□ Initial value

● 0 ○ 1

You type a **Tag Name**, a **Comment** and select as **Type: 'Internal Variable'**

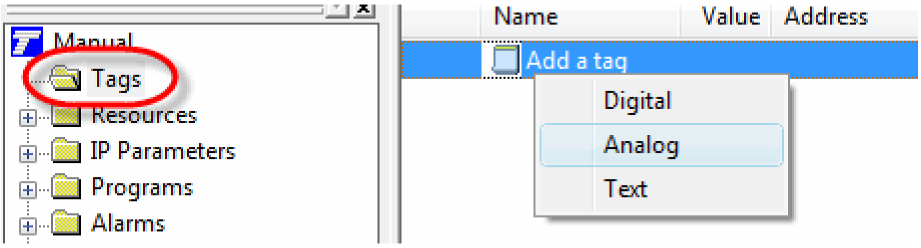
The **initial value** is the value the Tag will have at the start up of ***TBox MS***.
If you select *'None'* **the value is maintained** at start up.

ModBus Address is discussed in chapter 8.3

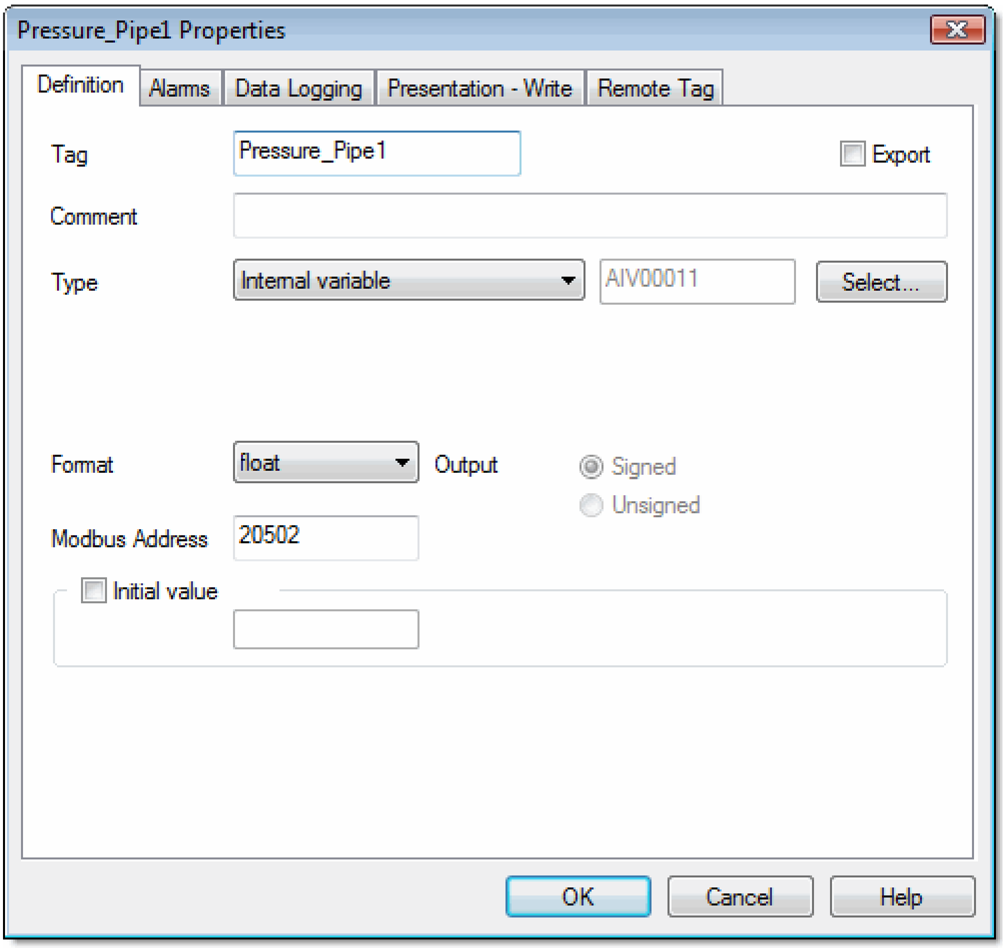
8.2.2. Analog Internal Variable

To create an Analog Internal Variable (also known as Register), from the list of Tags, click '*Add a Tag*'.

Select '*Analog*'



The Definition menu pops up:



Tag: Pressure_Pipe1

□ Export

Comment:

Type: Internal variable AIV00011

Format: float

Output: ● Signed ○ Unsigned

Modbus Address: 20502

□ Initial value

Example with a '32 bits – Unsigned' internal variable

You type a **Tag Name**, a **Comment** and select as **Type: 'Internal Register'**

For each Analog Register, the formats available are:

- 8 bits (Signed or Unsigned)
- 16 bits (Signed or Unsigned)
- 32 bits (Signed or Unsigned)
- Float (IEEE 754)

By default, TWinSoft creates Analog Internal Variable in **format 'Float'**.
Check it fits with the use you intend to have with the variable.

The **initial value** is the value the Tag will have at the start up of ***TBox MS***.
If you leave the field empty, **the value is maintained** at start up.

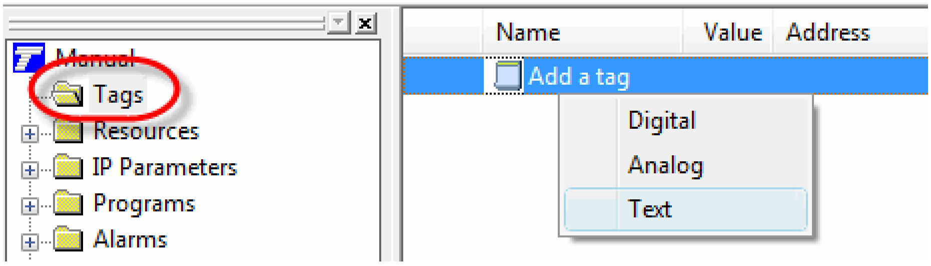
ModBus Address is discussed in chapter 8.3

8.2.3. Text Internal Variable

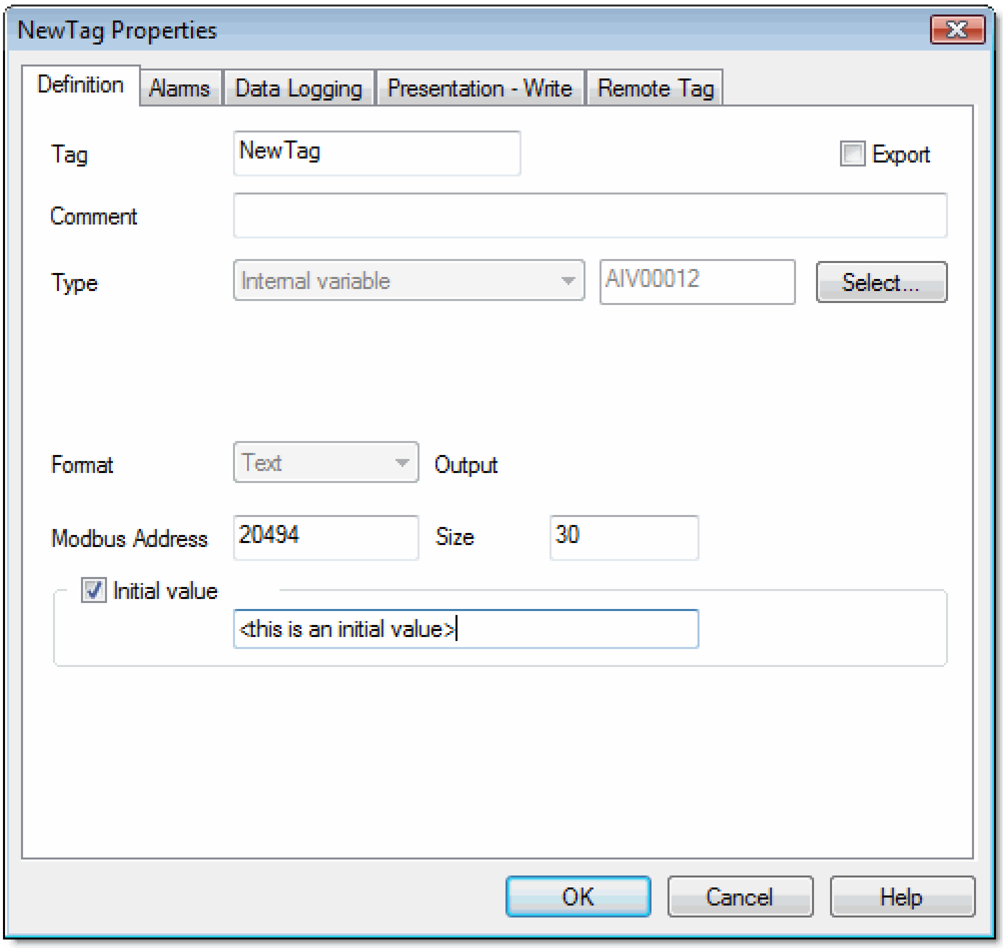
The Tag TEXT uses ASCII character encoding **ISO/CEI 8859-1** of the Latin alphabet.

To create a Tag TEXT (string of characters), from the list of Tags, click '*Add a Tag*'.

Select '*Text*'



The Definition menu pops up:



NewTag Properties

Tag: NewTag

□ Export

Comment:

Type: Internal variable AIV00012

Format: Text Output

Modbus Address: 20494 Size: 30

☑ Initial value: <this is an initial value>

8.3. ModBus address

The ModBus address is the **link to the outside world**. When equipment must sample Tags in ***TBox MS***, it uses its ModBus addresses; like Tview , SCADA or TWinSoft.

Each **Tag has a unique ModBus address**. By default TWinSoft proposes a ModBus address. You can change it if you want.

While being On-line, the value of the Tag can be displayed only when **TWinSoft has sent the program** to ***TBox MS***.

The Tag is then available for the outside world **at the ModBus address you have declared**.

8.3.1. ModBus address of System Variables

With System Variables it is a little bit different; they have **two ModBus addresses**:

- One **internal and fixed** ModBus address that you don't know. That explains why when you are connected to ***TBox MS***, even without sending a program, you still can see values from the Resources.
- One **user** ModBus address that you are allowed to modify if you want. When you create a Tag of system variable, you can change its default ModBus address.
  In case you wish to access the Tag, you declare this **user** ModBus address.

Other Tabs of the Tag configuration refer to menu where the Tag can be declared:
For **Alarms**, see chapter 10
For **Datalogging**, see chapter 12
For **Remote Tags**, see chapter 13
About **Presentation-write**, see next chapter

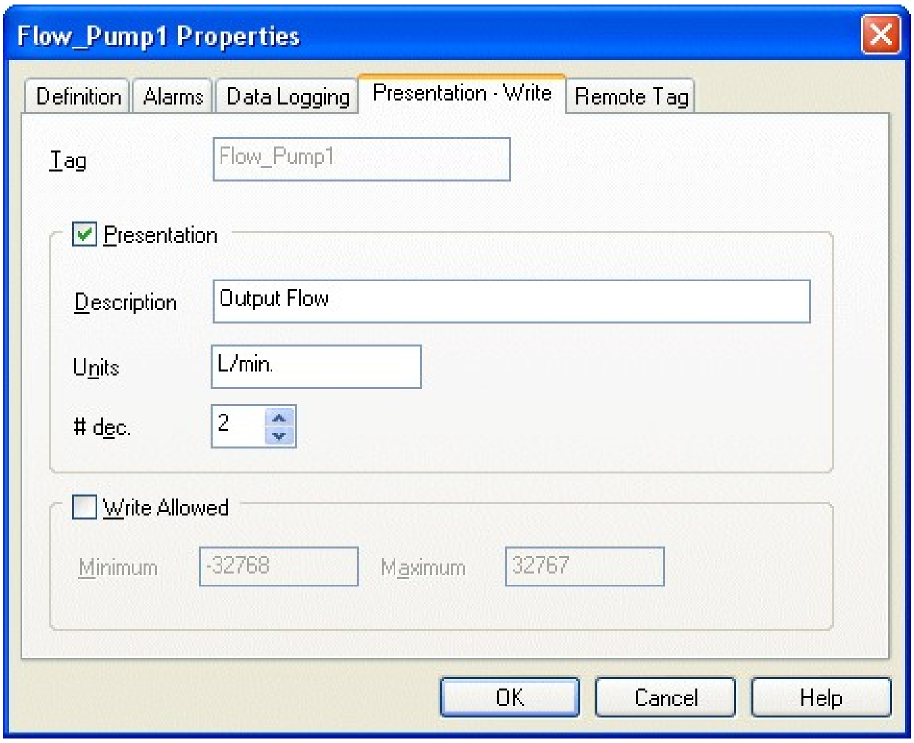
8.4. Tags - Presentation / Write

This tab contains configuration used when the Tag is declared in a **Report** or in a **WebForm**.
The Description is also used in Tview .
Presentation settings can also be used when the Tag value is included in a SMS.

- Report: file edited with 'Report Studio' and used for instance as text body when sending **e-mail**.
  (Start 'Report Studio' from 'Windows' and the group of Programs of Techno Trade or from the 'Project Workspace' and the list of 'Web and Report files')

- WebForm: file edited with 'WebForm studio'. Used to display values of Tags in a **HTML page**.
  (Start 'WebForm Studio' from 'Windows' and the group of Programs of Techno Trade or from the 'Project Workspace' and the list of 'Web and Report files')

- SMS: with Digital Tags, the 'states' defined here will be used and with Float Tags, the number of decimals.
  (See also chapter 10.7.1. ***Value of Tag in message***)



Flow_Pump1 Properties

Tag: Flow_Pump1

☑ Presentation

Description: Output Flow

Units: L/min.

dec.: 2

□ Write Allowed

Minimum: -32768 Maximum: 32767

Presentation: makes the following information available to 'Report' and 'WebForm'.

Description: in a Report, text displayed as 'Header' in sampling table or as Tag information in chronologies when the data is retrieved.

Units: text displayed as 'Unit' in datalogging when the data is retrieved. It can also be displayed when selecting as format 'Value + unit' in the report or WebForm.

# decimal: the quantity of decimals of the value displayed.

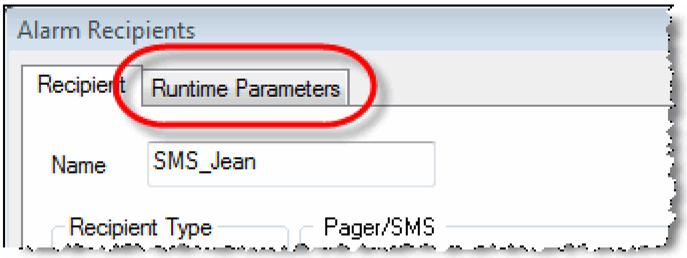
Write allowed: if the communication port to access the Tag is protected (see chapter 16), the proper access level is required to modify the Tag.
With 'Engineer' access level, the Tag can be modified without restriction.

8.5. Run Time Parameters

Run time parameters feature allows accessing some ***TBox MS*** configurations through Tags, in order to modify them "on line".
For instance, to change a **tel. number** of a SMS recipient, the **e-mail address** of a recipient, the address of **SMTP server**, the **handling** of a alarm condition.

When a configuration provides access to run time parameters, a tab is attached to the configuration.

Example with Alarm Recipient:

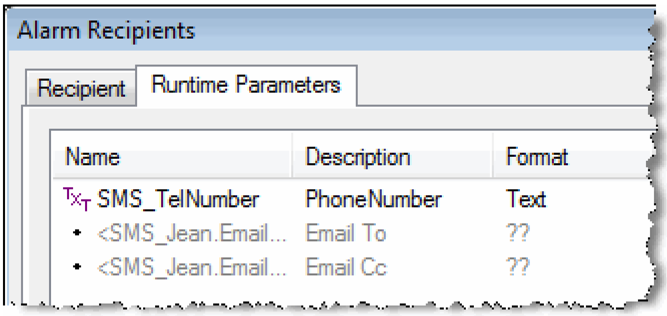


Alarm Recipients

Name: SMS_Jean

Recipient Type: Pager/SMS

You will associate a Tag to the run time parameter you want to add.
The Tag, and therefore its associated parameter, can then be modified from TWinSoft, a WebForm, a SCADA, ...



Alarm Recipients

Name	Description	Format
SMS_TelNumber	PhoneNumber	Text
<SMS_Jean.Email...	Email To	??
<SMS_Jean.Email...	Email Cc	??

The format of the Tag depends on the parameter (Bool, Byte, Word, Float, Text)

Changing of parameters is maintained in case of **power cycle**, **reset**, **reboot** and **watchdog**.
Original configuration is restored in case of **sending new program or OS** and doing **stop/ start from TWinSoft**.

8.5.1. Alarm Parameters

Alarm Condition

Parameter	Choice	Tag Format
Inhibition	0 = enabled 1 = disabled 2 = power fail 3 = DisAla 4 = DisAla2 5 = DisAla3 6 = DisAla4	Byte
Threshold (analog)		Byte or Word or DWord or Float
Hysteresis (analog)		Byte or Word or DWord or Float

Alarm Recipient

Parameter	Recipient Type	Tag Format
Phone Number	ModBus, SMS, Printer, RAS, Custom	Text
E-mail To	Email	Text
E-mail Cc	Email	Text

Alarm Time Slices

Parameter	Tag Format
From Hour	Byte
From Min	Byte
To Hour	Byte
To Min	Byte

Alarm Holidays

Parameter	Tag Format
Day	Byte
Month	Byte
Year	Word

8.5.2. Datalogging Parameters

Chronologies Condition

Parameter	Choice	Tag Format
Inhibition	0 = enabled 1 = disabled 2 = power fail 3 = DisCra/DisCrd	Byte
Variation (analog)		Byte or Word or DWord or Float

8.5.3. IP Parameters

ISP

Parameter	Tag Format
Phone Number	Text
User Name	Text
Password	Text

FTP

Parameter	Tag Format
Host	Text
TCP Port	Word
User Name	Text
Password	Text

SMTP

Parameter	Tag Format
Server	Text
TCP Port	Word
E-mail From	Text
Authentication	Bool
Login	Text
Password	Text

POP3

Parameter	Tag Format
Server	Text
TCP Port	Word
Authentication	Bool
Login	Text
Password	Text

NTP

Parameter	Tag Format
Server	Text

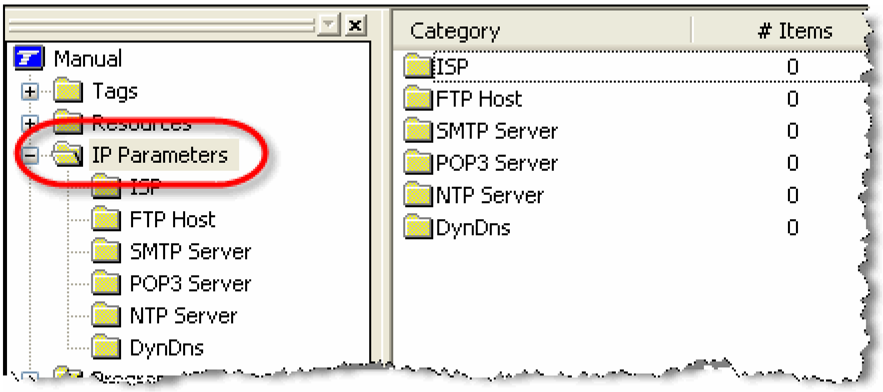
9. IP Parameters

IP parameters consist in the global configuration for:

- connecting to an ISP (dial-up connection)
- sending files (FTP)
- sending e-mail (SMTP)
- reading e-mail subject (POP3)
- Time synchronization (NTP)
- DynDNS (handling of public, dynamic IP addresses)

Concerning IP configuration of **Ethernet** card, refer to the corresponding card in the 'Resources'.
Concerning IP configuration for incoming calls (WebServer), see advanced RTU properties → TCP/IP

All IP parameters are defined in this Folder, available from the 'Resources'.



Category	# Items
ISP	0
FTP Host	0
SMTP Server	0
POP3 Server	0
NTP Server	0
DynDns	0

The FTP Host, SMTP Server, POP3 Server and NTP configurations correspond to connections to the appropriate servers. **It is done for once**, and called when creating a recipient of alarms.
This makes creating alarm recipients very easy !

Example with alarm for sending e-mail:

The **Recipient** is an 'e-mail' address which refers to a **SMTP server.**
This SMTP server refers to an **ISP**

In other way round, when ***TBox MS*** generates an e-mail, it sequences the configuration like following:

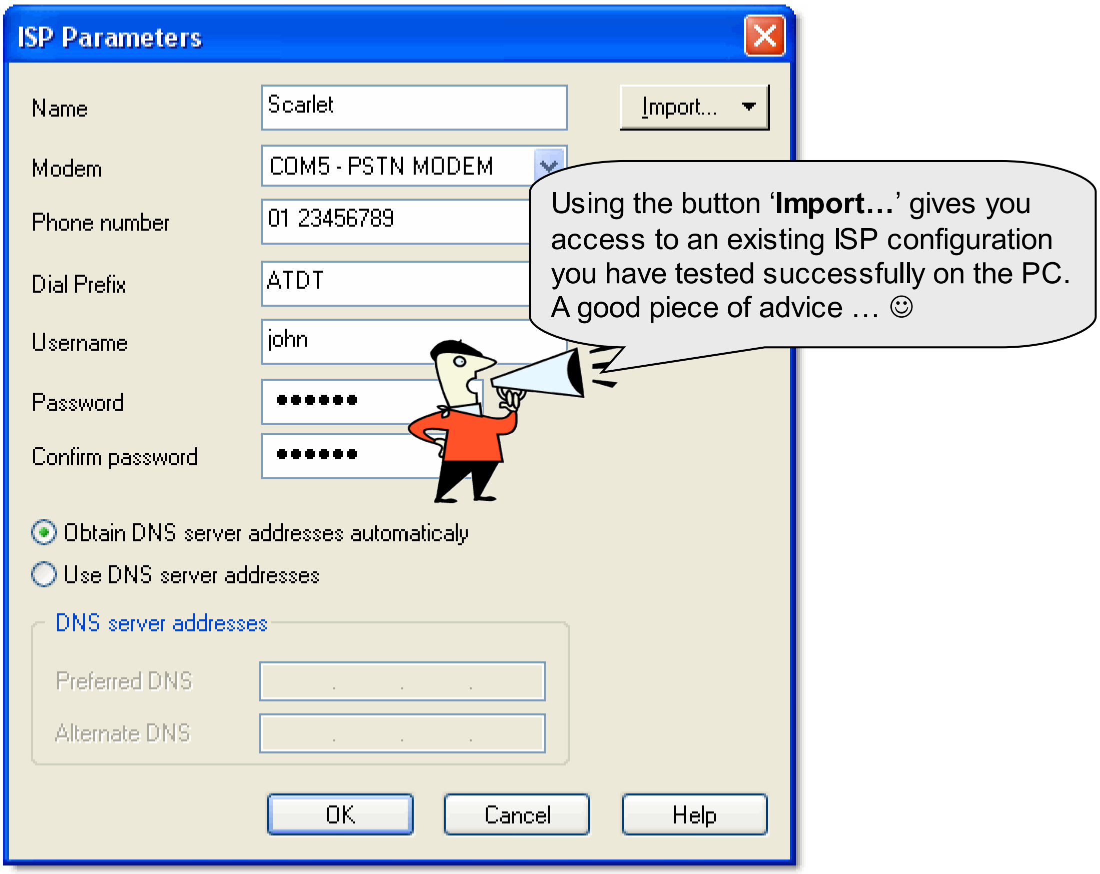
connection to an ISP → connection to a SMTP Server → sending to a recipient (e-mail address)

9.1. ISP configuration

ISP stands for **I**nternet **S**ervice **P**rovider. An ISP represents the entrance to Internet.
It is required to access Internet with a **dial-up connection** (PSTN, GSM-DATA).

It represents the connection to the company you call to access an Internet service, like sending e-mail or files (FTP).
Some among the most well-known: AT&T, Scarlet, Tiscali, …

When you want ***TBox MS*** to send e-mail or send files to a FTP site, you subscribe an account to an ISP.



ISP Parameters

Name	Scarlet
Modem	COM5 - PSTN MODEM
Phone number	01 23456789
Dial Prefix	ATDT
Username	john
Password	••••••
Confirm password	••••••

◉ Obtain DNS server addresses automaticaly
○ Use DNS server addresses

DNS server addresses

Preferred DNS	. . .
Alternate DNS	. . .

Using the button '**Import…**' gives you access to an existing ISP configuration you have tested successfully on the PC. A good piece of advice … ☺

Name: It is the name of the provider.

Modem: a connection to an ISP is always carried out through modem. Select the modem.

Phone number: It is the phone number of the provider the ***TBox MS*** must dial to send an e-mail or files.

Dial Prefix: The default dial prefix to connect to an ISP (ATDT). **It should not be changed** unless the modem needs a particular configuration.
If ***TBox MS*** is placed behind a telephone switch, the 'outside line prefix' is defined in the modem properties; **it should not be added to the dial prefix** (see chapter 7.2.2)

User name: It is the name of your account needed to access Internet (usually it is given by the ISP).

Password: It is the password of your account needed to access Internet (usually it is given by the ISP).

DNS: A DNS converts names in IP address. It is needed in case the Server (SMTP, FTP, NTP, POP3) is indicated in 'text' and not with an IP address.
More and more ISPs support dynamic DNS, they provide the DNS addresses when connecting.
If this is not the case, they provide you with a 'Preferred' and 'Alternate' DNS address

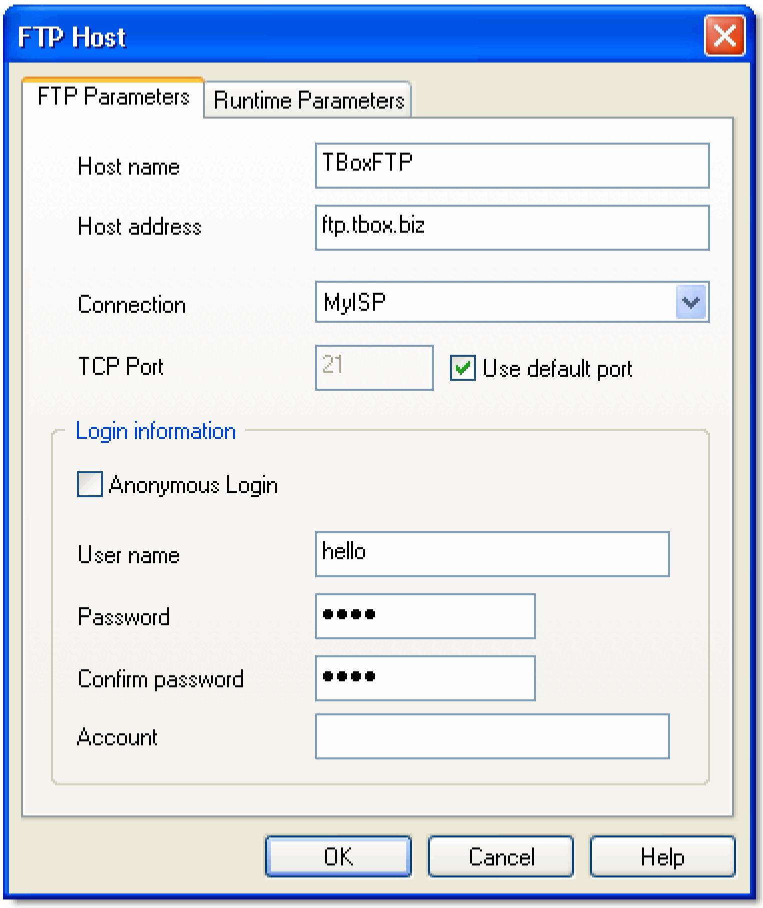
You can declare several ISP entries!
Then they can be used in redundancy through the sending of e-mails.
You are allowed to define several SMTP Servers (see next), associated to different ISP's.
Creating the alarm recipient, you can select the 'Redundancy' option

9.2. FTP Host

FTP stands for **F**ile **T**ransfer **P**rotocol. When subscribing an account to an ISP, usually you have some Mbytes to your disposal for sending files.

The FTP host represents the target when sending files. The directory where the files are sent is defined in the Recipient (see chapter 9).

First, ***TBox MS*** connects to Internet (through a connection: ISP, Ethernet or GPRS) and then sends the files.



FTP Host

Host name: TBoxFTP

Host address: ftp.tbox.biz

Connection: MyISP

TCP Port: 21 ☑ Use default port

Login information

□ Anonymous Login

User name: hello

Password: ••••

Confirm password: ••••

Account:

Host Name: It is a free name, to recall when you create the alarm recipient

Host address: text and IP address are accepted.

Connection: You select the way to connect to the Server (ISP, GPRS, Ethernet).

TCP port: Each TCP/IP service has its own unique TCP port. It provides a logical location for the delivery of TCP data.
TCP port used by ***TBox MS*** to establish FTP connection (default=21).

Login: Depending on the account you have subscribed, you have a login or work with 'Anonymous login'.

This is the basic configuration to connect to the 'FTP site'.
You **do not declare a directory** in this configuration, but when declaring the 'Recipient' (see chapter 10.4. ***The Recipients***).
This allows creating any combination:
- several 'FTP recipients' to one FTP site
- several 'FTP recipients' to different FTP sites.
- ...

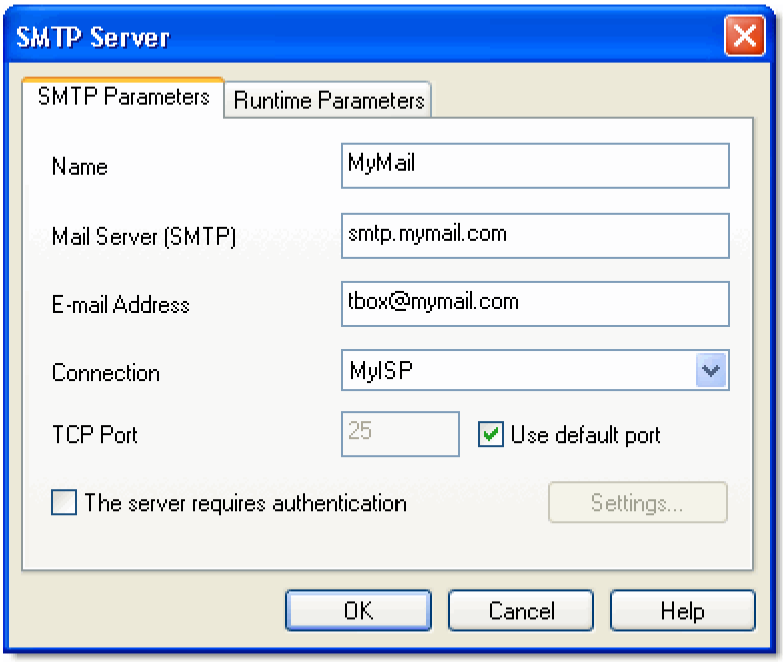
9.3. SMTP Server

SMTP stands for **S**imple **M**ail **T**ransfer **P**rotocol. It is usually the main reason for subscribing an account to an ISP, for sending and reading e-mail.

Concerning e-mail, ***TBox MS*** is able to send e-mail (through SMTP server) and to read e-mail (through POP3 server)

The SMTP Server represents the mail server used for sending e-mail (typically the one of the ISP where we have subscribed an account).

First, ***TBox MS*** connects to Internet (through a connection: ISP, Ethernet or GPRS) and then to the SMTP Server.



SMTP Server

SMTP Parameters | Runtime Parameters

Name: MyMail

Mail Server (SMTP): smtp.mymail.com

E-mail Address: tbox@mymail.com

Connection: MyISP

TCP Port: 25 ☑ Use default port

☐ The server requires authentication

Name: It is a free name, to recall when you create the alarm recipient.

Mail Server (SMTP): It is the IP address (or the name) of the outgoing e-mail Server. It is the unique mail Server needed to send e-mail.

E-mail address: It is the e-mail address of the ***TBox MS***. You can usually choose it when you subscribe an account. This address will appear in the 'From:' when receiving the mail.

In order to **protect the mail server** (and you) against spamming, the ISP might to refuse sending e-mail if the address of the originator is not known. Therefore, be careful to indicate here **the e-mail address you have received from your ISP**.

Connection: You select the way to connect to the Server (ISP, GPRS, Ethernet).

TCP port: Each TCP/IP service has its own unique TCP port. It provides a logical location for the delivery of TCP data.
TCP port used by ***TBox MS*** to establish SMTP connection (default=25).

The Server requires Authentication: Depending on your ISP and on the way you send e-mail, authentication might be needed to send e-mail.
Usually, when you have subscribed the e-mail account at your ISP it is not required.
To be sure, if you have created this account on a PC, check its configuration otherwise contact your ISP.

TBox MS supports one SMTP authentication protocol:
PLAIN authentication.
Check with your ISP.

9.3.1. About Redundancy

If you create more than one SMTP Server, they can be used in redundancy in accordance to their order in the list.
You decide to work with redundancy when creating the e-mail recipient (see chapter 10.4).

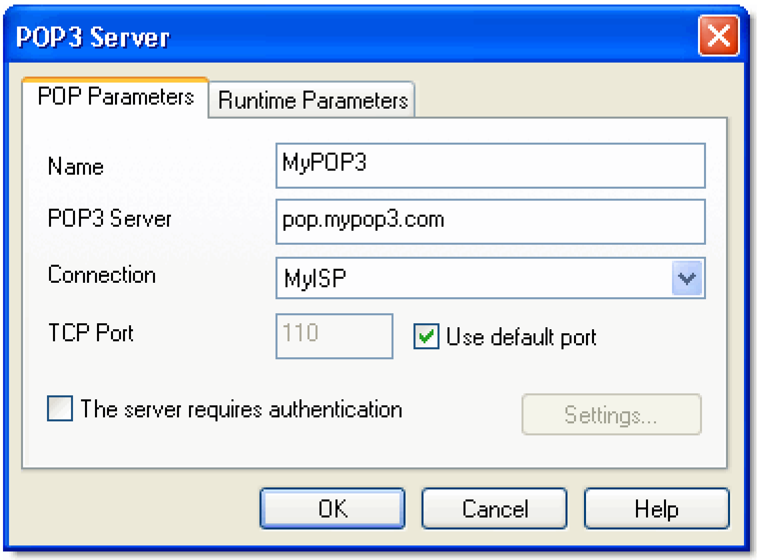
9.4. POP3 Server

POP3 stands for **P**ost **O**ffice **P**rotocol 3. It is used to check and collect e-mails in a mail box.

The POP3 Server represents the mail server used to read mails previously sent to the attention of ***TBox MS***.

The use of POP3 is not to retrieve e-mail, but to read the field "Subject" and take some actions.
There are 2 actions that can be taken by sending e-mail to TBox:
a. Alarm acknowledgment sent through e-mail (see next page)
b. RTU monitoring with predefine message (see chapter 11. ***ReadSMS***)

First, ***TBox MS*** connects to Internet (through a connection: ISP, Ethernet or GPRS) and then to the POP3 Server.



Name: MyPOP3
POP3 Server: pop.mypop3.com
Connection: MyISP
TCP Port: 110 ☑ Use default port
☐ The server requires authentication

Name: It is a free name, to recall when you create the alarm recipient.

POP3 Server: It is the IP address (or the name) of the POP3 Server to which ***TBox MS*** connects to read e-mails.

Connection: You select the way to connect to the Server (ISP, GPRS, Ethernet).

TCP port: Each TCP/IP service has its own unique TCP port. It provides a logical location for the delivery of TCP data.
TCP port used by ***TBox MS*** to establish POP3 connection (default=110).

The Server requires Authentication: If authentication required to collect e-mail: Login and Password.
TBox MS does not support SSH.

9.4.1. Alarm Acknowledge Through POP3

Introduction

With the ***TBox MS*** sending a SMS through a GSM, it is possible to acknowledge the alarm by sending back a SMS to ***TBox MS***
In some cases, mostly working in GPRS, SMS can be sent through e-mail services. In return, it is then possible to acknowledge the alarm using POP3 connection.

Sequence of connections

1. ***TBox MS*** sends an e-mail. The alarm condition has been configured with the option "**POP3 Ack**". It is important you have a dedicated e-mail account for your RTU. The data sent by e-mail can be a report or a message.
2. The recipient retrieves its e-mail. The field "Subject" of the e-mail is preceded with internal data: RTU Id **(I)** and Alarm index **(A)**
   Example of message: **#I460000020107,A00004# MyTBox: PUMP stopped**
3. The user sends back the e-mail. Typically, he will make a "Reply" and sends back the e-mail to the address as specified in point 1. above, in the SMTP server
4. ***TBox MS*** generates a POP3 connection (through alarm condition) and checks the presence of e-mail with specific data in field "Subject". With this data, ***TBox MS*** knows which alarm for which RTU it can acknowledge.
   The POP3 connections have to be handled into your process and can be checked from System Variables (see below)

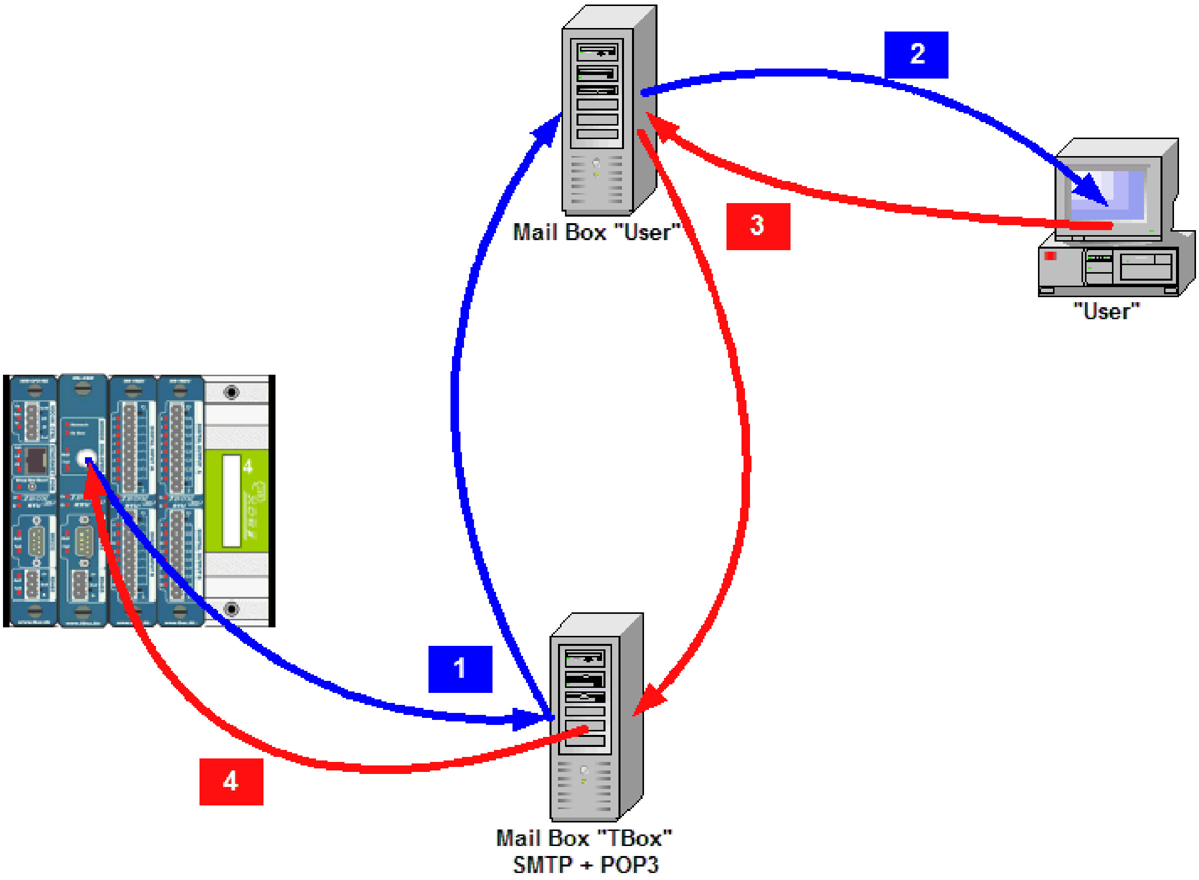


Illustration with a TBox MS

Supplementary information

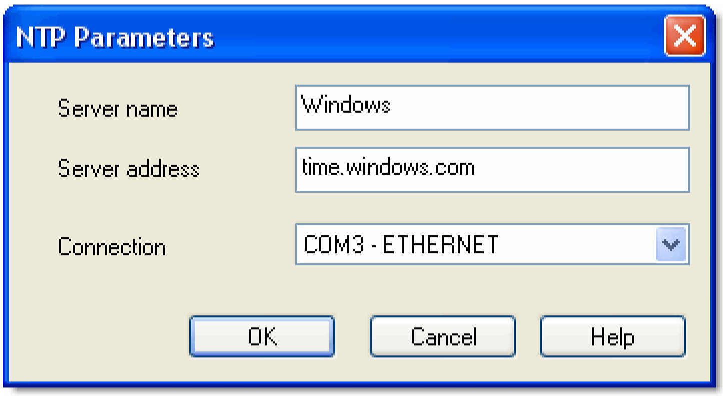
1. The time between phases 1 and 4 can be determined in RTU properties --> Advanced Alarms properties
2. System Analog Variable: #40 **[AlaPop3]** indicates the number of alarm needing to be acknowledged by POP3 connection and #43 **[Pop3State]** indicates the state of connection.
3. If escalation is required, Group of recipients can be associated to the alarm condition
4. Like other alarms, failure in sending SMTP alarms can be checked using System Digital Variable: #06 **[AlaErr]** and System Analog Variable: #10 **[AlaRec]**
5. Error in POP3 connection can be detected also using System Digital Variable: #48 **[POP3Err]**

9.5. NTP Server

NTP stands for **N**etwork **T**ime **P**rotocol, an Internet standard protocol (built on top of TCP/IP) that assures accurate synchronization to the millisecond.

The NTP Server represents a server dedicated to time synchronization.

First, ***TBox MS*** connects to Internet (through a connection: ISP, Ethernet or GPRS) and then to the NTP Server.



Server name: Windows

Server address: time.windows.com

Connection: COM3 - ETHERNET

Example with a connection to Windows server through Ethernet

Examples of Servers:

time.windows.com
europe.pool.ntp.org

You will find valuable information, like lists of Servers with open access at:

www.ntp.org → public time server list

The organization pool.ntp.org proposes servers using DNS round robin, which make a **random selection from a pool** of open access time servers. This is good enough when working with ***TBox MS***.

Round Robin DNS technique is used when the number of access to a server is unpredictable, to balance the use of IP addresses (load balancing technique).

9.5.1. Time accuracy

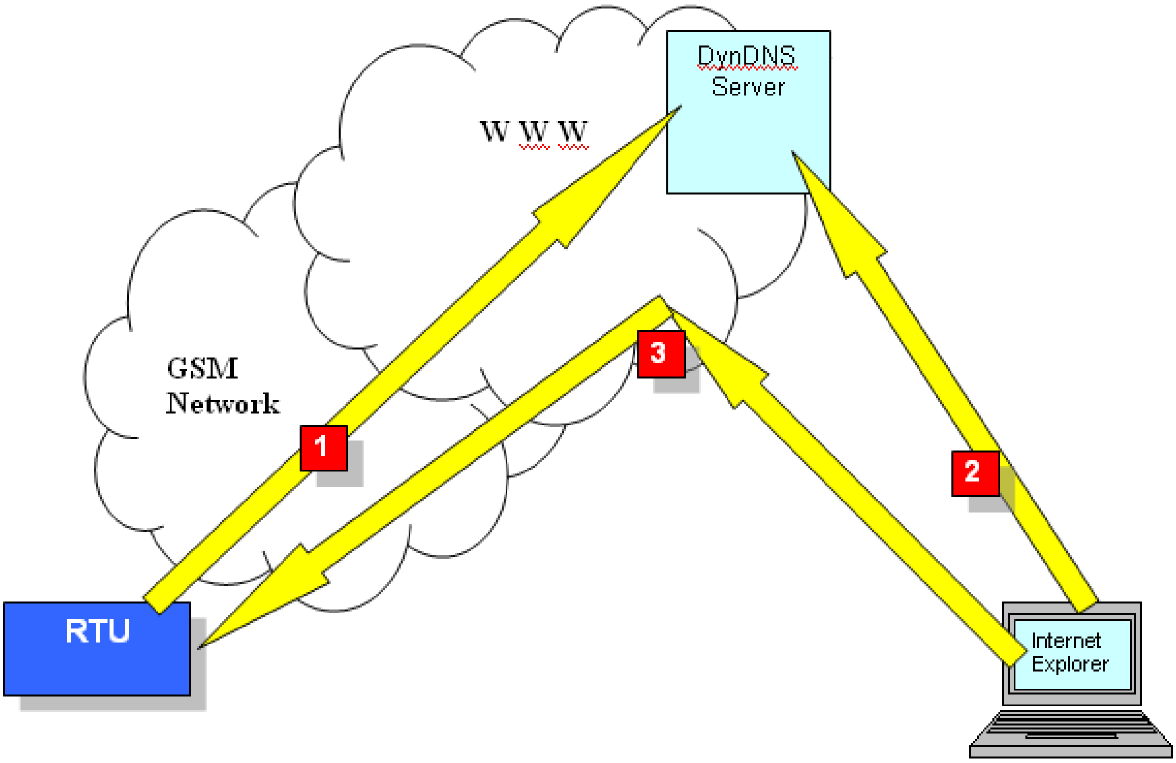
When setting time, ***TBox MS*** takes into account the propagation delay. This is particularly important when connecting to the server via modem.

The precision is **1 second**.

9.6. DynDNS

DynDNS stands for **Dyn**amic **D**omain **N**ame **S**ystem.
It is a service, provided by the company DynDNS.org, offering the handling of **dynamic IP addresses**.
When working with GPRS connection, using public dynamic IP addresses, it is not possible to access the RTU directly, as you don't know its IP address.
The DynDNS service solves this problem: each time the RTU **detects a changing of its IP address**, it informs the DynDNS server.
You then connect to the DynDNS Server that will redirect you to the RTU.

Example of topology : connecting with Internet Explorer to a RTU having a **GPRS dynamic IP address**.



Sequence:

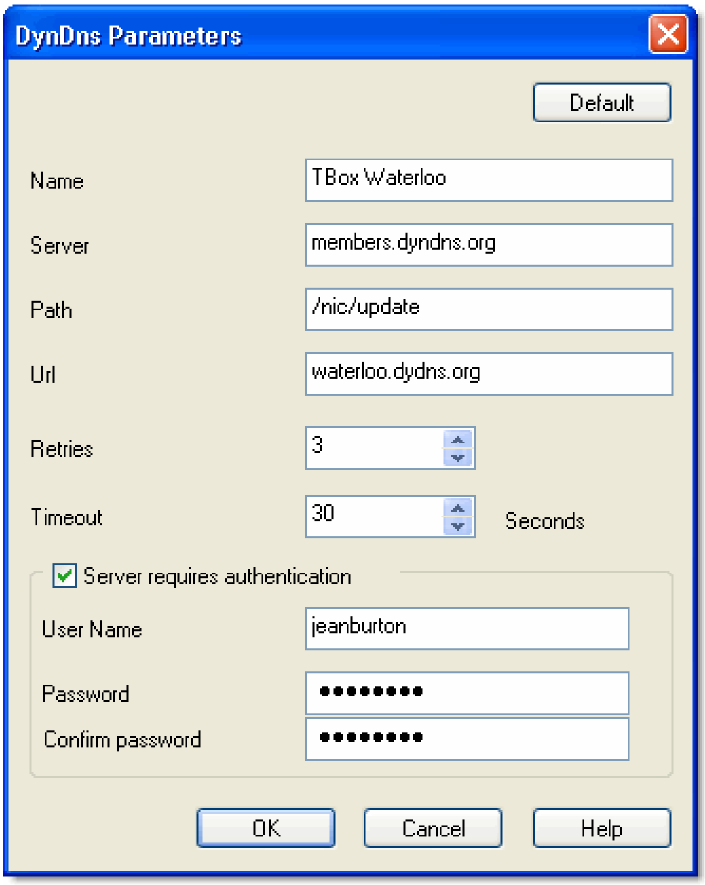
1. Detecting a changing in its IP address, the RTU informs the DynDNS Server.
2. If you want to connect to TBox with Internet Explorer you connect to the DynDNS Server (example: **http://waterloo.dyndns.org**). The DynDNS Server resolves the name and sends back the corresponding IP address.
3. Internet Explorer connects to the IP address it has received.

9.6.1. How to configure DynDNS in TBox

1. Subscribe a DynDNS account:

- Go to www.dydns.org
- Create an Account
- Create a Host

2. Create in TWinSoft IP parameters the connection to DynDNS:



Name: TBox Waterloo
Server: members.dyndns.org
Path: /nic/update
Url: waterloo.dydns.org
Retries: 3
Timeout: 30 Seconds
☑ Server requires authentication
User Name: jeanburton
Password: ••••••••
Confirm password: ••••••••

Name
Type any name

Server
DynDNS Server to which ***TBox MS*** will connect when it detects a changing in its IP address. It should not be changed.

Path
Location in the server of the table of correspondences between IP address --> name. It should not be changed.

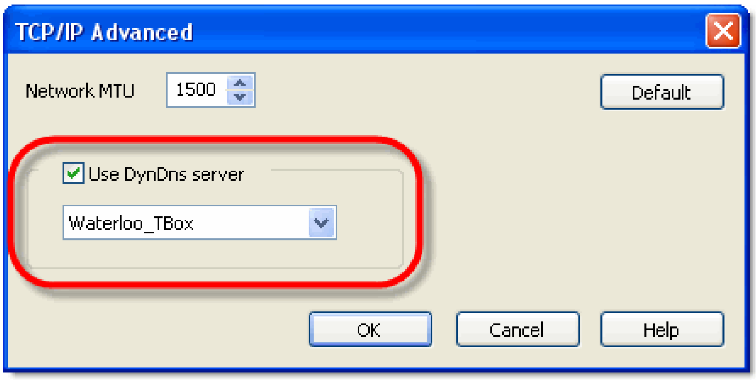
Url
You type the host address you have creating when subscribing the DynDNS account.
Example: waterloo.dyndns.org

Server requires authentication
Select the option to type the **login** corresponding to the account you have created at DynDNS organization.

User name
Type the login name of your account.

Password
Type the login password of your account.

3. Associate the DynDNS configuration to the modem (see communication port → TCP/IP → Advanced...)



Network MTU: 1500
☑ Use DynDns server
Waterloo_TBox

10. Alarms

10.1. Introduction

Alarm module of ***TBox MS*** is the gate to the outside world.

An alarm consists in a **communication event**, not only for sending warning messages but to establish a connection, like we will see.

Via alarms, you are able to **call a SCADA**, send **SMS** or message to Pagers, send **e-mail**, send files to a **FTP** site, **dial** another ***TBox MS*** or **send a report** to a printer.

Alarms can be used also to **send historical data (datalogging)** on regular base using e-mail or FTP. The historical data is sent as the attached file of a report, developed using ***Report Studio*** (see from 'Windows' the group of programs of 'Techno Trade').
TView, the supervisory software can then be used to collect data from a mail box or a FTP site.

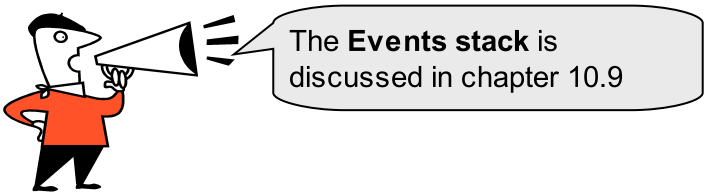
The initiation of alarms in the ***TBox MS*** relies on the variation of digital or analog Tags.
For example, an intrusion contact or a flow level generates a call.

<u>There are three basic configurations for an alarm:</u>

- **The condition:** a changing in a Tag.
- **The recipient:** to whom the alarm is sent.
- **The message** (or report)**:** information to sent to the recipient.

Each new alarm is immediately entered into a **32-alarms queue** (adjustable) and processed, according to its severity level. Alarms are generated one by one.
The alarm queue represents an **internal buffer of alarms**: if several alarms happen at the same time or if a communication port is not available when the alarm happens.

The **Events stack**, gives information about alarms status (Started – Stopped – Acknowledged).

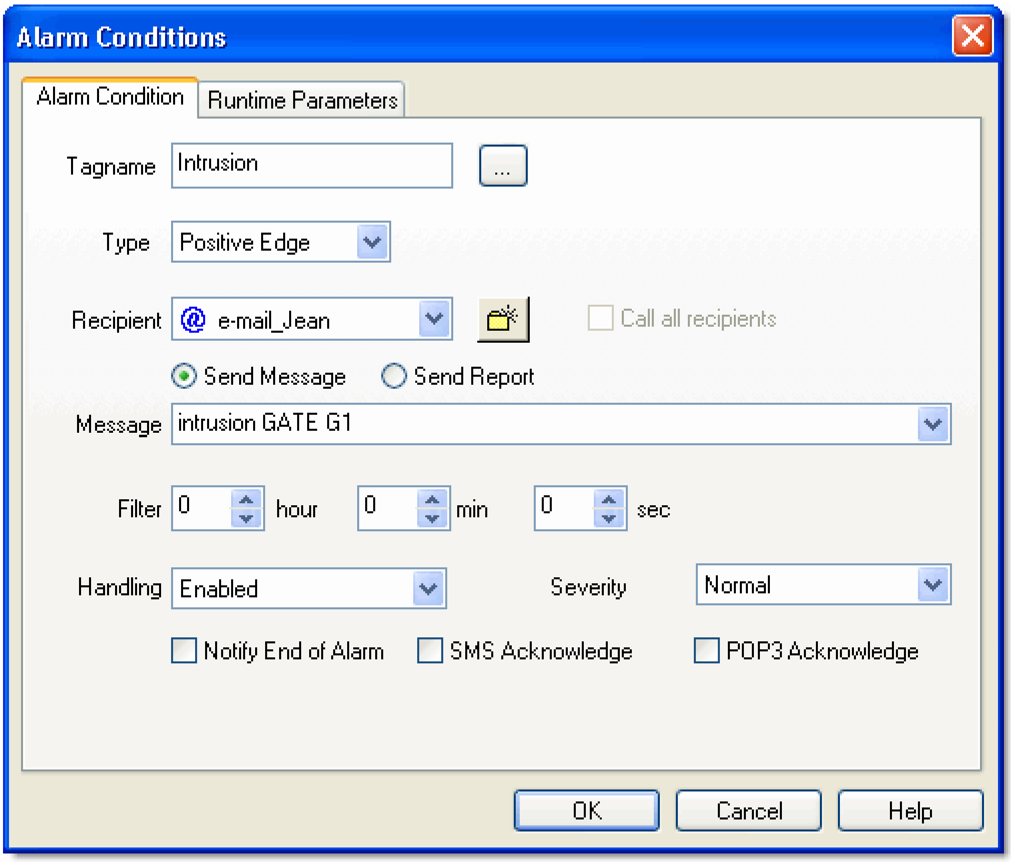


The **Events stack** is discussed in chapter 10.9

To access the definition of Conditions, click the folder 'Alarms' in the Project workspace and select 'Conditions'.

According to the Tag you select, you define a **digital alarm condition** or an **analog alarm condition**.

10.2. Digital Alarm Condition



Tagname: Intrusion

Type: Positive Edge

Recipient: e-mail_Jean

□ Call all recipients

● Send Message ○ Send Report

Message: intrusion GATE G1

Filter: 0 hour 0 min 0 sec

Handling: Enabled

Severity: Normal

□ Notify End of Alarm □ SMS Acknowledge □ POP3 Acknowledge

Tagname: The Tag selected to generate the alarm.

Type: The edge on which the alarm is going to be started (rising, falling or both).

Message or Report: **text** or **file** associated to the alarm.

Depending on the type recipient associated, you can send a message or a report. It is the SMS message sent to a GSM, the message/report sent as e-mail, the message/report printed, or the file sent by FTP …

It also appears in the table of alarms, to distinguish them (see chapter 10.8).

If the alarm condition sends an **e-mail**, it can be of 2 kinds:
Message: a text message is sent and it appears in the 'object' field of the e-mail
Report: sending of a report created with ***Report Studio***. The report can be created from the Project Workspace and the list of 'Web & Report files'.

Recipient: Select a **Recipient** or a **group of recipients**. The 'person' you wish to contact in case of alarm (see 'Recipients' below).
In case you select a '**group of Recipients**' see next.

Call all Recipients: To be used when selecting a **Group of Recipients**.

When the option is cleared: ***TBox MS*** calls the first one in the group. In case the alarm cannot be acknowledged after the number of tries, ***TBox MS*** automatically calls the next Recipient in the group and so on until it succeeds. Then it stops. (Also known as 'Chain')

When the option is checked: ***TBox MS*** sends the alarm to all recipients of the group. (Also known as 'Link')

Filter: The time in hour:minute:second during which the condition must stay TRUE, before the call is generated.

Filter can be tested either during both transitions or only during the transition selected (see chapter 6.5.2)

Handling: The handling option allows blocking each alarm condition, manually or automatically.

- Enabled: alarm condition always active.
- Disabled: alarm condition always de-activated.
- PowerF: alarm condition disabled when there is a main power failure.
- DisAla: alarm condition de-activated when the system variable 'DisAla' is at 1.

Severity: Each alarm can be assigned a level of severity: Low, Normal or High. When several alarms are still present in the queue and then not processed yet, ***TBox MS*** generates the calls according to the highest severity.

End of Alarm: When the alarm condition is finished, an alarm is automatically sent to the same recipient with the same message **preceded by a prefix** (see chapter 6.5.2).

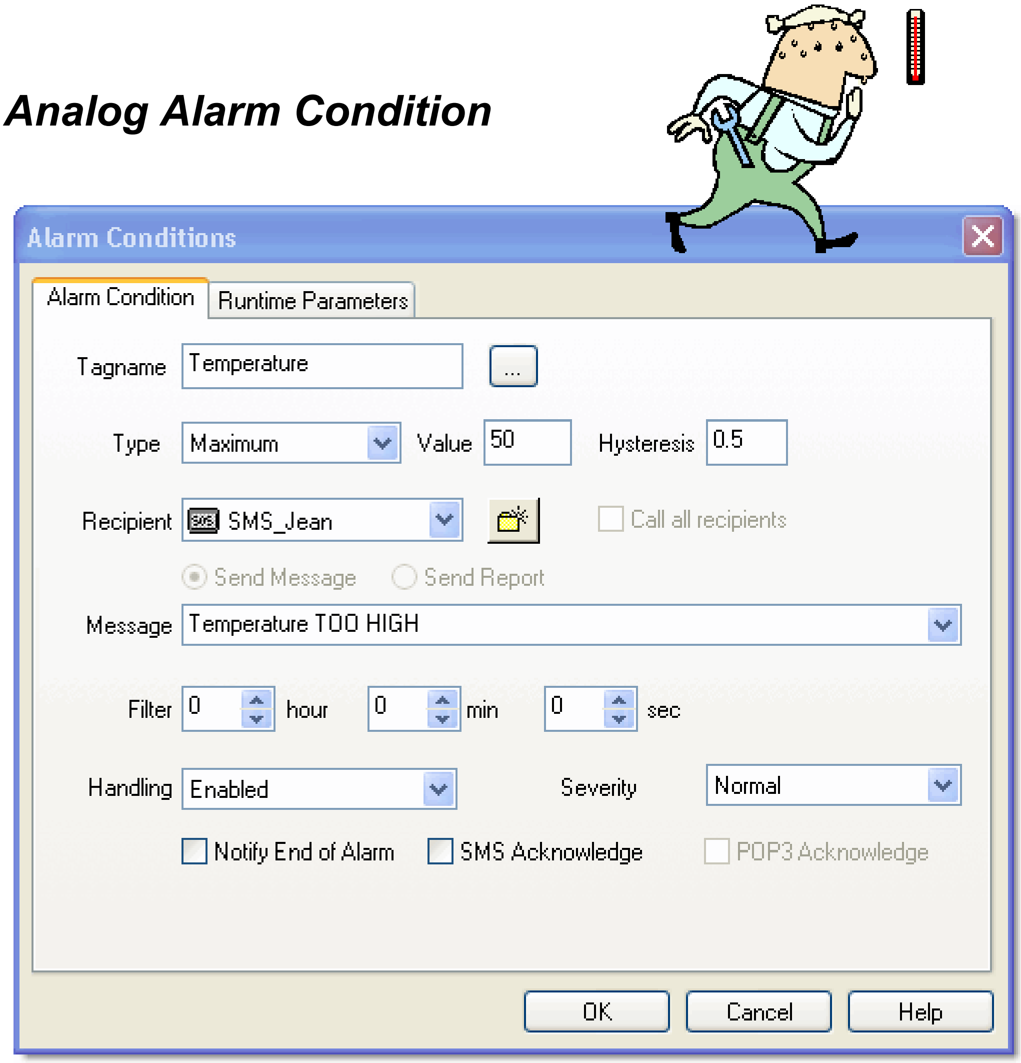
Example: for a 'positive edge' alarm, it is when the Tag returns to '0'.

It is also useful when the alarm condition is active when ***TBox MS*** starts up. When 'end of alarm' is checked, an alarm is automatically generated when the alarm condition disappears (see illustration chapter 10.8: ***Alarms table***)

SMS acknowledge: See chapter 11.2.

POP3 acknowledge: See chapter 9.4.1

10.3. Analog Alarm Condition



Tagname: Temperature

Type: Maximum Value: 50 Hysteresis: 0.5

Recipient: SMS_Jean □ Call all recipients

● Send Message ○ Send Report

Message: Temperature TOO HIGH

Filter: 0 hour 0 min 0 sec

Handling: Enabled Severity: Normal

□ Notify End of Alarm □ SMS Acknowledge □ POP3 Acknowledge

Tagname: The Tag selected to generate the alarm.

Type: Maximum or Minimum.
The threshold for which the alarm will be started. If the value of the analog Tag passes under (minimum) or over (maximum) this threshold, the alarm is started. If an alarm must be generated for both a maximum and a minimum threshold, 2 conditions must be declared with the same Tag.

Value: The threshold value, depending on the format defined when creating the Tag (see chapter 8. ***The Tags***).

Hysteresis: The amount that the level must fall or rise below or above the Max. or Min. value before an alarm can be re-started.

<u>Relation between Value and Hysteresis</u>

With "MAXIMUM" threshold	Value > threshold = Alarm TRUE
	Value < (threshold – hysteresis) = Alarm FALSE

With "MINIMUM" threshold	Value < threshold = Alarm TRUE
	Value < (threshold + hysteresis) = Alarm FALSE

Recipient: Select a **Recipient** or a **group of recipients**. The 'person' you wish to contact in case of alarm (see 'Recipients' below).
In case you select a '**group of Recipients**' see next.

Call all Recipients: To be used when selecting a **Group of Recipients**.

When the option is cleared: ***TBox MS*** calls the first one in the group. In case the alarm cannot be acknowledged after the number of tries, ***TBox MS*** automatically calls the next Recipient in the group and so on until it succeeds. Then it stops. (Also known as 'Chain')

When the option is checked: ***TBox MS*** sends the alarm to all recipients of the group. (Also known as 'Link')

Message or Report: **text** or **file** associated to the alarm.

Depending on the recipient associated, it is the SMS sent to a GSM, or the message/report sent as e-mail or the text printed, or the file sent by FTP …

It also appears in the table of alarms, to distinguish them (see chapter 10.8).

If the alarm condition sends an **e-mail**, it can be of 2 kinds:

Message: a text message is sent and it appears in the 'object' field of the e-mail

Report: sending of a report created with 'Report Studio'. The report can be created from the Project Workspace and the list of 'Web & Report files'.

Filter: The time in hour:minute:second during which the condition must stay TRUE, before the call is generated.

Filter can be tested either during both transitions or only during the transition selected (see chapter 6.5.2)

Handling: The handling option allows blocking each alarm condition, manually or automatically.

- Enabled: alarm condition always active.
- Disabled: alarm condition always de-activated.
- PowerF: alarm condition disabled when there is a main power failure.
- DisAla: alarm condition de-activated when the system variable 'DisAla' is at 1.

Severity: Each alarm can be assigned a level of severity: Low, Normal or High. When several alarms are still present in the queue and not processed yet, ***TBox MS*** generates the calls according to the highest severity.

End of Alarm: When the alarm condition is finished, an alarm is automatically sent to the same recipient with the same message **preceded by a prefix** (see chapter 6.5.2).

Example: for a 'maximum' alarm, it is when the value returns below maximum - hysteresis.

It is also useful when the alarm condition is active when ***TBox MS*** starts up. When 'end of alarm' is checked, an alarm is automatically generated when the condition of alarm disappears (see illustration chapter 10.8: ***Alarms table***)

SMS acknowledge: See chapter 11.2.

POP3 acknowledge: See chapter 9.4.1

10.4. Recipients

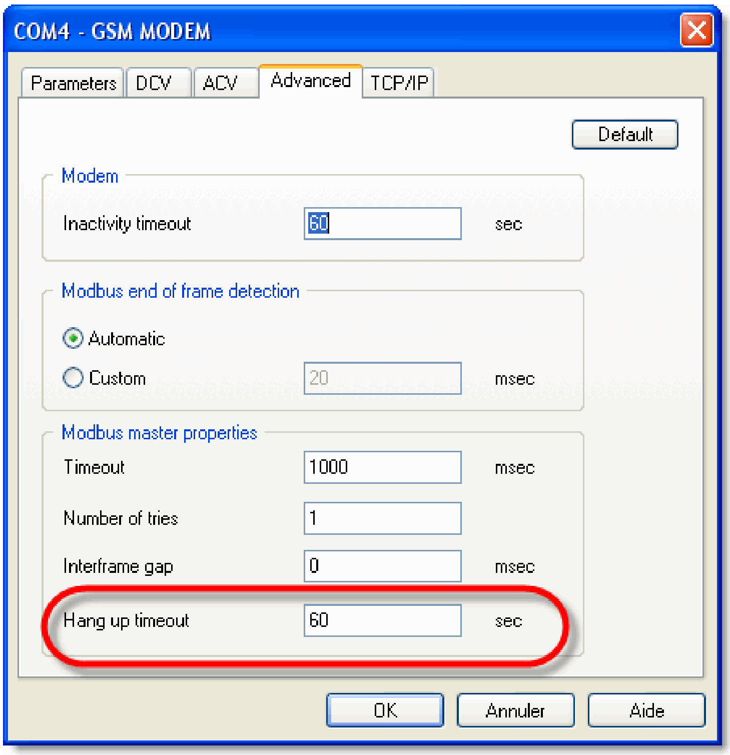
To access the definition of Recipients, click the folder 'Alarms' in the Project workspace and select 'Recipients'.

The types of recipients supported are:

Internal: the alarm is saved in the stack of events and **no call is generated**.
It can be used to memorize a particular event without generating an alarm or to test an alarm condition.

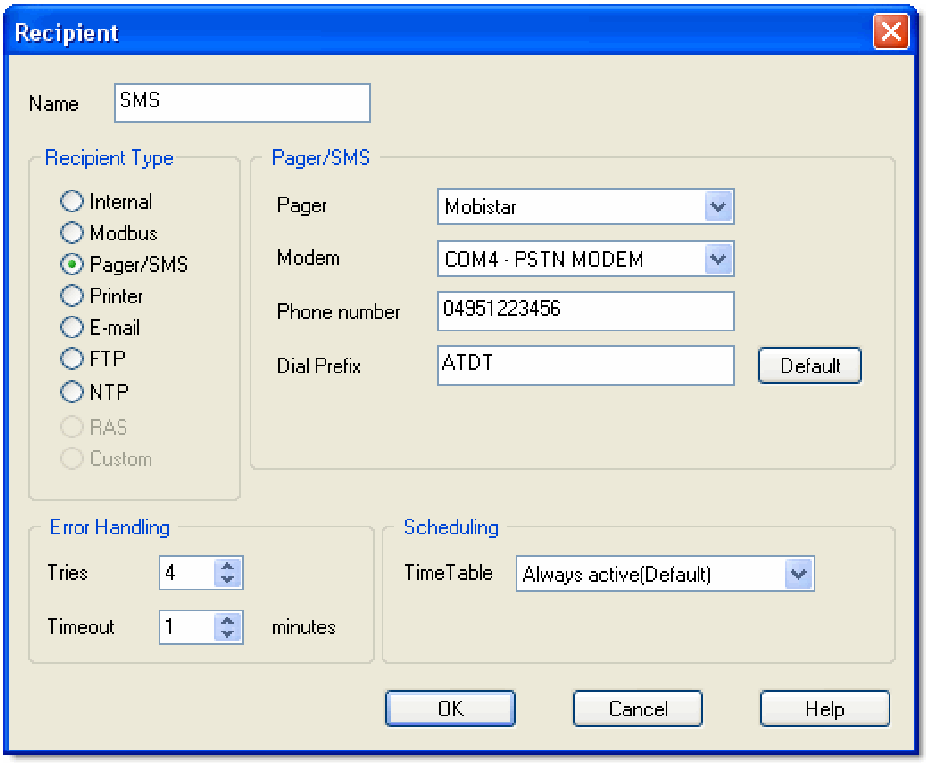
ModBus: it can be Master or Slave.
It is used to establish a **ModBus connection** to another ModBus device or a SCADA (for instance Tview).
The difference between Master and Slave concerns the handling of the modem connection and acknowledgment.
A 'Slave' connection means that ***TBox MS*** dials an equipment and doesn't do anything else. The dialed equipment will sample, acknowledge and hang-up. Typically used for instance when dialing Tview .
A 'Master' connection means that ***TBox MS*** dials a ModBus equipment and will also sample this equipment (with Remote Tags).
TBox MS will then be also responsible for acknowledgment (see chapter 7.4.2: ***System variables*** [8] AlaID or [10] AlaRec) and hanging-up (see 'Advanced' properties of the communication port used to send the alarm)

A modem parameter: "**Hang up timeout**" is used by 'ModBus-Master' alarm to define the maximum connection time. The maximum value is 600 seconds.



Inactivity timeout 60 sec
● Automatic
○ Custom 20 msec
Timeout 1000 msec
Number of tries 1
Interframe gap 0 msec
Hang up timeout 60 sec

Pager/SMS: to send **SMS** to a mobile or message to a **Pager**.
Select the **Service** corresponding to the pager or mobile and a **Modem**.
Type the **Phone Number** of the Pager or Mobile.
The default **Dial prefix** is ATDT. **It should not be changed** unless the modem needs a particular configuration.
If ***TBox MS*** is placed behind a telephone switch, the 'outside line prefix' is defined in the modem properties (see chapter 7.2.2)



Recipient

Name: SMS

Recipient Type:
○ Internal
○ Modbus
● Pager/SMS
○ Printer
○ E-mail
○ FTP
○ NTP
○ RAS
○ Custom

Pager/SMS

Pager: Mobistar

Modem: COM4 - PSTN MODEM

Phone number: 04951223456

Dial Prefix: ATDT

Error Handling

Tries: 4

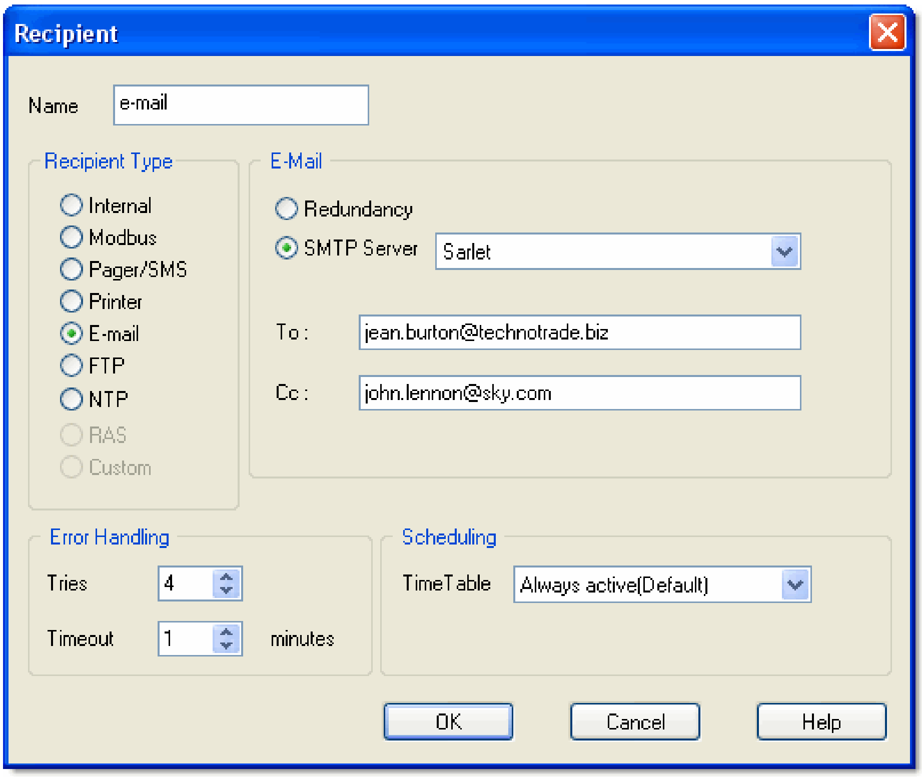
Timeout: 1 minutes

Scheduling

TimeTable: Always active(Default)

Printer: sending of message(s) or report to a local printer.

E-mail: If you have subscribed an e-mail account (see chapter 9.3. ***SMTP Server***), the ***TBox MS*** is able to send an e-mail. You only have to specify the e-mail address of the recipient.



Recipient

Name: e-mail

Recipient Type:
○ Internal
○ Modbus
○ Pager/SMS
○ Printer
● E-mail
○ FTP
○ NTP
○ RAS
○ Custom

E-Mail

○ Redundancy

● SMTP Server: Sarlet

To : jean.burton@technotrade.biz

Cc : john.lennon@sky.com

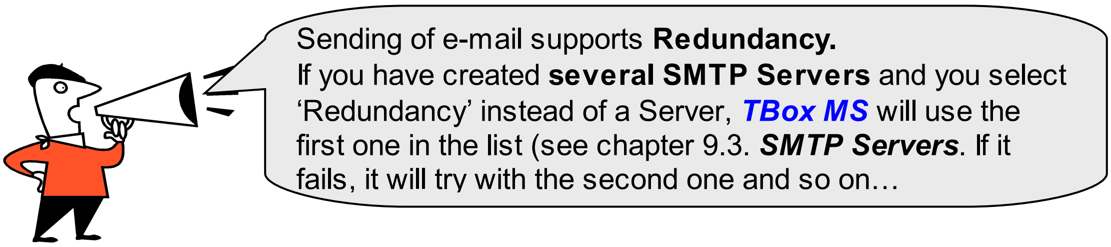
Error Handling

Tries: 4

Timeout: 1 minutes

Scheduling

TimeTable: Always active(Default)



Sending of e-mail supports **Redundancy.**
If you have created **several SMTP Servers** and you select 'Redundancy' instead of a Server, ***TBox MS*** will use the first one in the list (see chapter 9.3. ***SMTP Servers***. If it fails, it will try with the second one and so on…

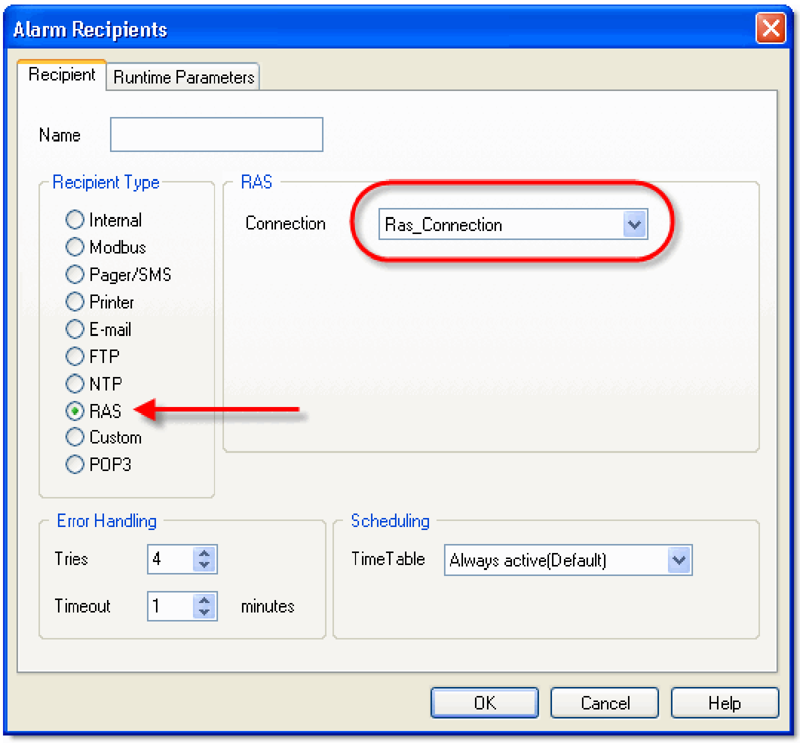
FTP: *TBox MS* is able to send files to a FTP Host (see chapter 9.2. ***FTP Host***). In the recipient configuration you only need to indicate the directory where you want to send the files.

NTP: *TBox MS* is able to synchronize its clock with an external NTP server. In the recipient, you only select a server you have created in the list of NTP Servers (see chapter 9.5. ***NTP Server***).

RAS: This type of recipient can be used to establish a 'Client' modem connection to a 'Server'. The Server is considered by *TBox MS* as an ISP: it requires a telephone number and a login to establish the connection. You associate an ISP (previously created in the IP parameters of TWinSoft), and when connection is established, the 'Server' has to communicate in protocol **ModBus-TCP**

It can be assimilated to a 'Modbus-Slave' connection using ModBus-RTU protocol.

The Server is responsible of acknowledgment and hanging-up



Alarm Recipients

Recipient | Runtime Parameters

Name:

Recipient Type: ○ Internal ○ Modbus ○ Pager/SMS ○ Printer ○ E-mail ○ FTP ○ NTP ● RAS ○ Custom ○ POP3

RAS — Connection: Ras_Connection

Error Handling — Tries: 4; Timeout: 1 minutes

Scheduling — TimeTable: Always active(Default)

Custom: in case a 'C' driver allows sending alarms

POP3: allows reading e-mail to acknowledge e-mail or to operate TBox with a message (see details in chapter 10.4.1)

10.5. Dynamic Change of recipient tel number or address

This feature has been maintained for compatibility with older application. Instead, you should use the runtime parameters, offering more flexibility (see chapter 8.5).

10.5.1. Dynamic changing of telephone numbers

You can change the telephone number of any recipient using its ModBus address:
To calculate the ModBus address: (MSB*256) + LSB.

MSB:	254 (= base address of 65024)
LSB:	index of the recipient.

Example: to change the telephone number of recipient #5:
(254*256)+5 = 65029

This address can be used in **a label of WebForm Studio → select address**, with as type 'String' to display the telephone number. **To modify it**, make it 'write enable' from the label settings.

10.5.2. Dynamic changing of ONE e-mail address

Only e-mail address of the **recipient #1** can be updated. It means that if you wish to use this feature, be sure you have declared the recipient 'e-mail' with index #1 in the list of recipients.

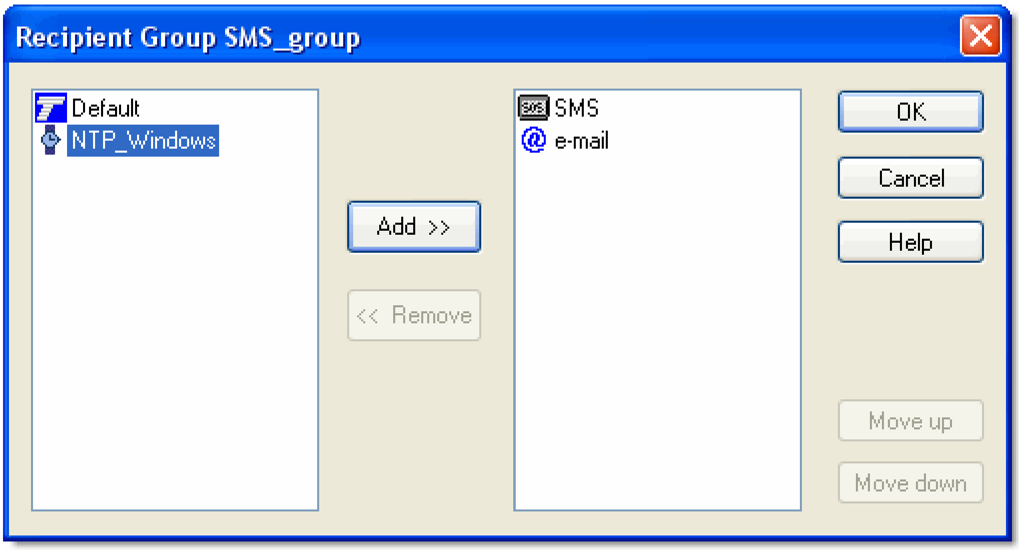
Its **ModBus address** is: 64769

This address can be used in **a label of WebForm Studio → select address**, with as **type 'String'** to display the current e-mail address. **To modify it**, make it 'write enable' from the label settings.

10.6. Group of Recipients

A group of recipients is composed of several recipients, which can be of different types (SMS, e-mail, …).
You can declare several groups.

Then previous to creating groups of recipients, you have to create the recipients (see above).



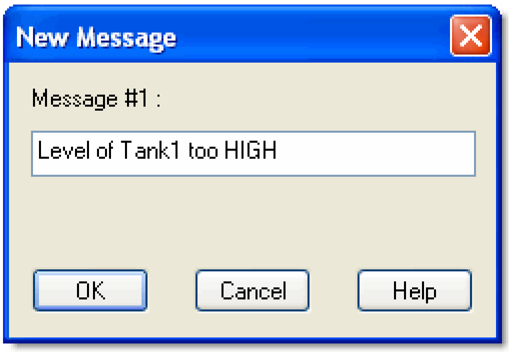
You can then associate an Alarm condition to a 'recipient' or a 'group of recipients'.

Working with groups of recipients offers 2 possibilities:

1. You select the option 'Call all recipients': the alarm is sent to **all recipients**, one after each other (→ equivalent to the '**Link**' with previous generation of RTU, the *TBOX*).
2. You don't select the option 'Call all recipients': the alarm is sent to the first one in the list then if it fails to the second then if it fails to the third …
When it succeeds the sending stops.
(→ equivalent to the '**Chain**' with previous generation of RTU, the *TBOX*).

10.7. Messages

To access the definition of Alarm messages, click the folder 'Alarms' in the Project workspace and select 'Messages'.



Level of Tank1 too HIGH

Message number : indicates the index of message corresponding to its position in the list of messages. Type a message of maximum 120 characters.
This message is user specific:
- If it is for a Digital Pager, it will consist only of numbers.
- If it is for a Text Pager or for a GSM, it will not contain accent (ü, é, à, ...)

10.7.1. Value of Tag in a message

Two kinds of value are available:

The value at the moment the alarm is sent

The value will be the value of the Tag **at the moment the alarm is accessed**: the SMS is sent, the alarm list is displayed in a WebForm, the alarms retrieved from TView, ...
The syntax is: **~TAG~** (with TAG=the name of the Tag).

The value at the moment the alarm appeared

The value will be **frozen** to the one at the moment the alarm is stored in the stack of events.
The syntax is: **TAG** (with TAG=the name of the Tag).

Remarks:
1. Tag TEXT cannot be used in a message with Tag. No problem with ~Tag~.
2. With MS-16 and TBox-LITE: ONE **Tag** can be inserted in a message. No limit with ~Tag~
3. With MS-32: TWO **Tag** can be inserted in a message. No limit with ~Tag~

With a **Digital Tag** for which you have defined 'States' in the 'Presentation' menu, those states will used; otherwise, 0 and 1.
With a **Float Tag** for which you have defined a number of decimals in the 'Presentation' menu, this number will be used; otherwise, fixed to 3 decimals.

10.7.2. “String” in a message

Possibility to include a series of ASCII characters in one alarm message.
Put character Hyphen " - " in front of the TAG. Syntax like follows:

I say **~-TAG~** to everybody

~-TAG~ will be replaced by characters corresponding to ASCII code, starting at Tag "TAG". It ends when code **0x00** is encountered or after 32 characters.

Example
with the following value at TAG and following:
TAG : 0x48 (H)
TAG+1: 0x45 (E)
TAG+2: 0x4C (L)
TAG+3: 0x4C (L)
TAG+4: 0x4F (O)
TAG+5: 0x00

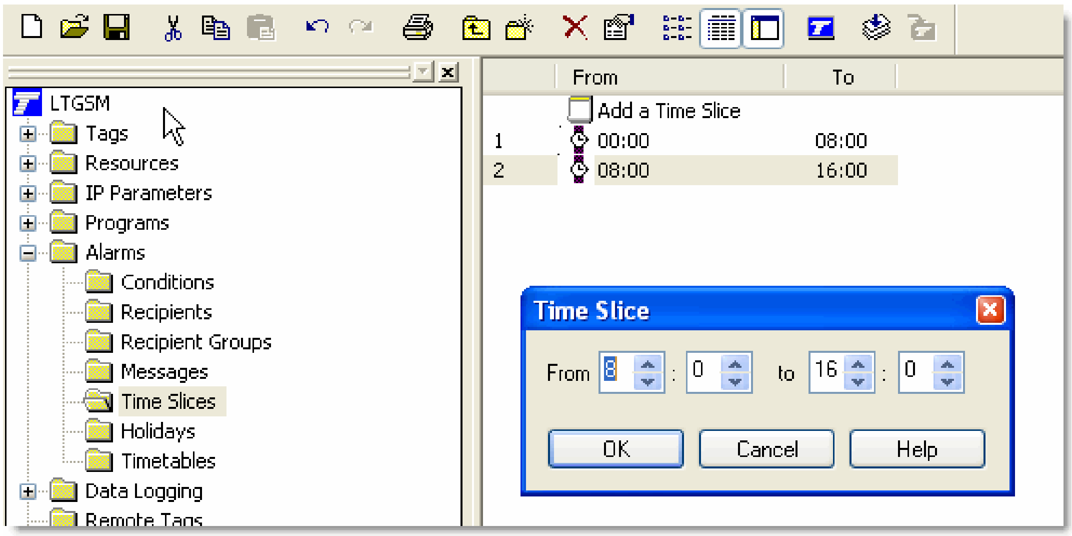
The following message will be generated: **I say HELLO to everybody**

10.8. Alarm Timetables

Alarm timetables allows specifying an activity period associated to a recipient, in other words, periods of time during the day, the week, the year, when a recipient can receive an alarm.
The time tables are based on the specification of 'Time Slices' (time periods of the day) and on 'Days' (days of the week and holidays).

10.8.1. Time Slices

The time slices are used to trunk the day in different slices. Further, you select those Time slices when creating timetables.
To declare the time slice, just select the start time and the end time of the slice.
A time slice **can't be part of 2 different days**: no time slice can include midnight! (e.g. 18h30 to 08h30)



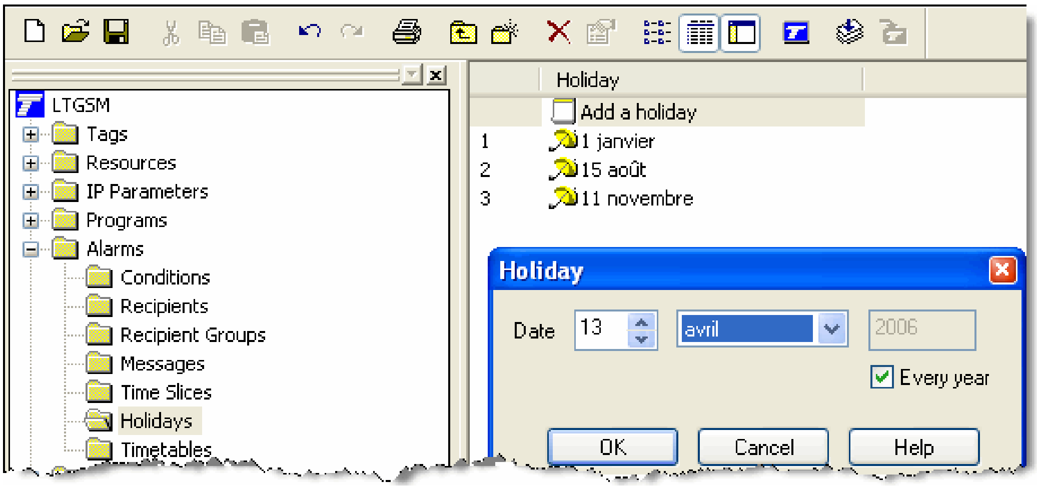
	From	To
	Add a Time Slice	
1	00:00	08:00
2	08:00	16:00

Time Slice

From 8 : 0 to 16 : 0

10.8.2. Holidays

The holidays offer to flag specific days of the year; these days can be checked in the timetables (all at once, not separately or by groups) like if it was a specific day of the week (see Time Tables next).
You can choose to keep each selected day as holiday for 'every year' (by default).



	Holiday
	Add a holiday
1	1 janvier
2	15 août
3	11 novembre

Holiday

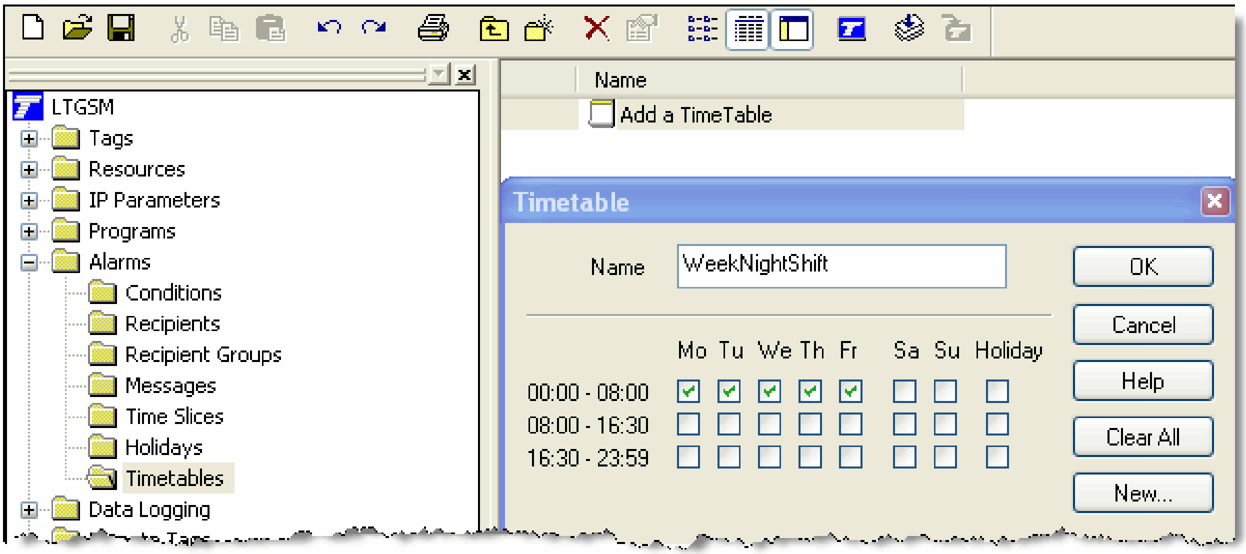
Date 13 avril 2006

☑ Every year

10.8.3. Timetables

Based on the 'Time Slices', days of the week and 'Holidays' you create different 'Timetables' according to activity periods in your company (day shift, night shift, holidays, week-end, ...). A time table can then be associated to a recipient.

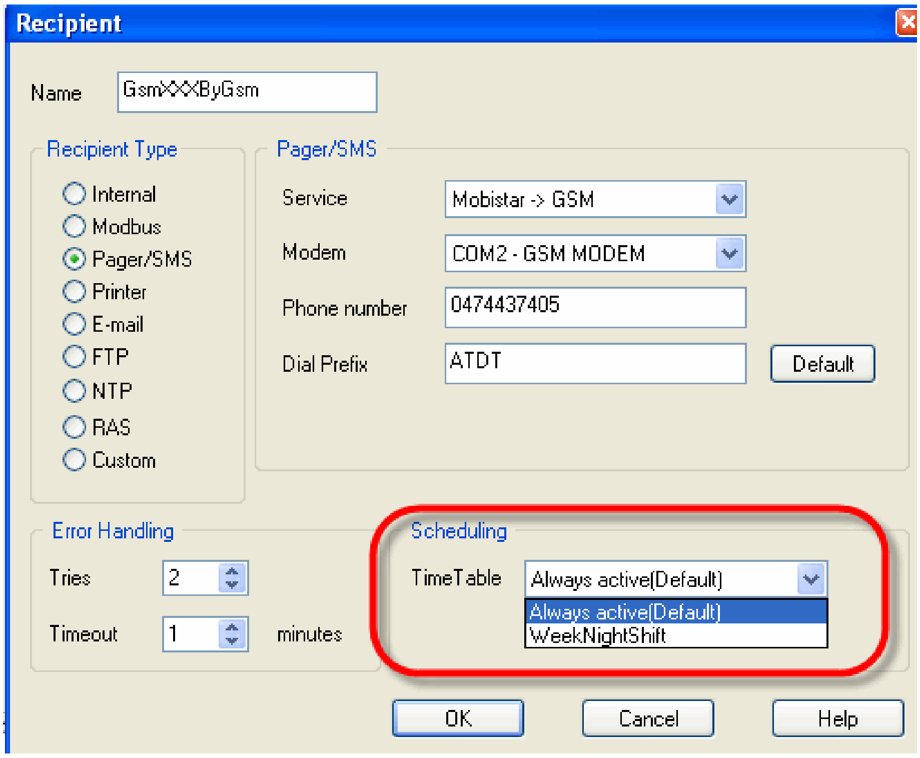
You select for each day of the week (Holidays being treated like a unique 'day') which time slice will be part of the timetable.



Name: WeekNightShift

	Mo	Tu	We	Th	Fr	Sa	Su	Holiday
00:00 - 08:00	☑	☑	☑	☑	☑	□	□	□
08:00 - 16:30	□	□	□	□	□	□	□	□
16:30 - 23:59	□	□	□	□	□	□	□	□

Following, in the recipients' setting, you can choose to have the recipient 'always active' or only during a particular timetable (e.g. Day shift without week-end and holidays).



Name: GsmXXXByGsm

Recipient Type: ○ Internal ○ Modbus ● Pager/SMS ○ Printer ○ E-mail ○ FTP ○ NTP ○ RAS ○ Custom

Service: Mobistar -> GSM

Modem: COM2 - GSM MODEM

Phone number: 0474437405

Dial Prefix: ATDT

Tries: 2

Timeout: 1 minutes

TimeTable: Always active(Default)

Always active(Default)
WeekNightShift

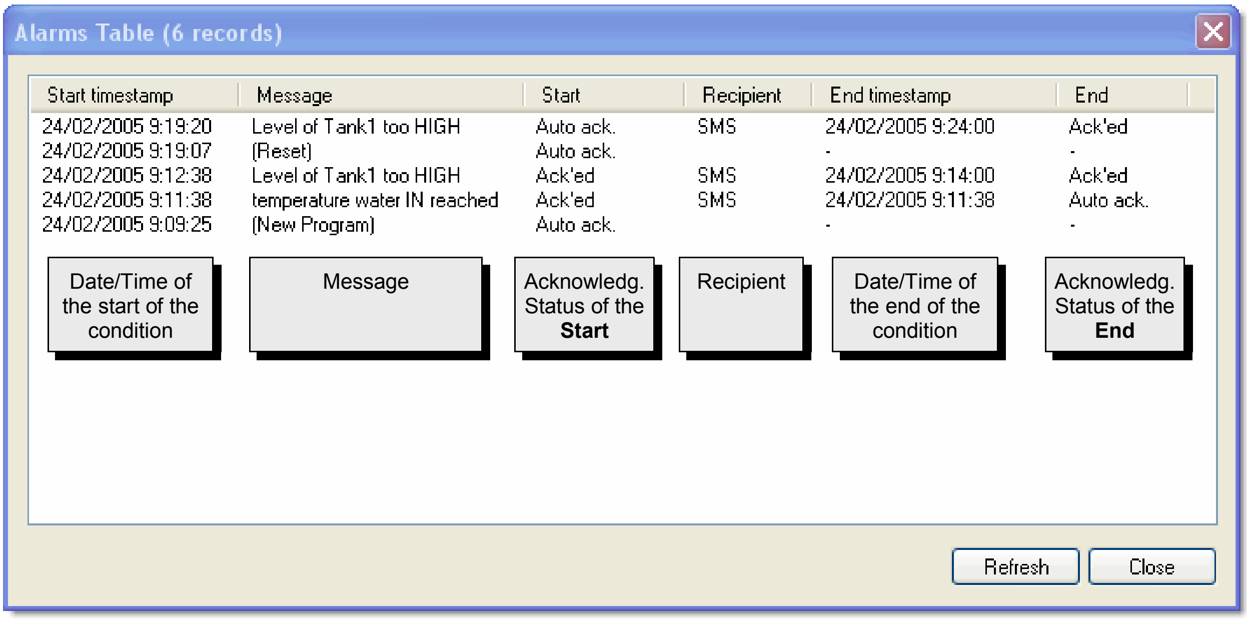
If an alarm occurs when time table is active, the alarm will be sent. Otherwise, the alarm is automatically 'auto ack.' as you can read in the 'Alarm Table' (See here under).

10.9. Alarms table

The Alarms table displays the **Events stack** of ***TBox MS***.

The Events stack is the visible part of the handling of alarms in ***TBox MS***.
The internal alarms queue is not accessible.

You access the Alarms table from the main menu: Communication → Download → Alarms


Alarms Table (6 records)
Date/Time of the start of the condition
Message
Acknowledg. Status of the **Start**
Recipient
Date/Time of the end of the condition
Acknowledg. Status of the **End**
Refresh
Close

Start timestamp	Message	Start	Recipient	End timestamp	End
24/02/2005 9:19:20	Level of Tank1 too HIGH	Auto ack.	SMS	24/02/2005 9:24:00	Ack'ed
24/02/2005 9:19:07	[Reset]	Auto ack.		-	-
24/02/2005 9:12:38	Level of Tank1 too HIGH	Ack'ed	SMS	24/02/2005 9:14:00	Ack'ed
24/02/2005 9:11:38	temperature water IN reached	Ack'ed	SMS	24/02/2005 9:11:38	Auto ack.
24/02/2005 9:09:25	[New Program]	Auto ack.		-	-

The Alarms table does not only display alarms generated in ***TBox MS***, but also **system events** like start-up of the program, Reset of the ***TBox MS***, …

10.9.1. Columns description

Start Timestamp: Date and Time when the **alarm condition appears** ('Start' condition)

Message: Message (or name of the file) associate with the alarm.
System events appear between brackets.

Start: Acknowledgment status of the 'Start' condition.
The possibilities are:

- Not ack.: the alarm is still in process.
- Ack'ed: the alarm has been successfully processed.
- Auto ack.: the alarm has not been processed successfully.
  In case of 'system events', it is always the case as it is not an alarm but an event

Recipient: The name of the Recipient (from the list of Recipients).
The name is listed only if the alarm has been sent successfully.
With chained alarms, this allows showing the one that was used.
In case of 'system events', there is no name.

End Timestamp: Date and Time when the **alarm condition disappears** ('End' condition).

End: Acknowledgment status of the 'End' condition.

When creating an alarm condition, there is an option '**Notify end of alarm**'. This option will automatically generate an alarm when the condition generating the alarm disappears.

The possibilities are:

- Not ack.: there is a 'Notify end of alarm' condition and the alarm is still in process.
- Ack'ed: the 'end of alarm' has been successfully processed.
- Auto ack.: the 'end of alarm' has not been processed successfully.
  When there is **no 'end of alarm'**, it is immediately indicated as 'Auto ack.'

11. Read SMS embedded

11.1. Introduction

ReadSMS/POP3 is the capability of the RTU to receive and interpret incoming SMS messages, and to read “subject” field of e-mail to execute tasks.
It is integrated in TWinSoft and with *TBox MS* (**MS-CPU16 requires OS 3.08.xxx minimum**).
This feature requires a GSM on the RTU; only GSM can receive SMS!

For MS-CPU16:
If you intend to to use ReadSMS with an existing application developed with a TWinSoft older than 9.03.1021 and working on a *MS-CPU16* with an OS older than version 3.08.429, you have to update the initialization string of the GSM modem:

```
AT+IPR=57600^AT+CBST=0,0,1^ATE0Q0V1&C1&D2&K0^AT+CLIP=1
```

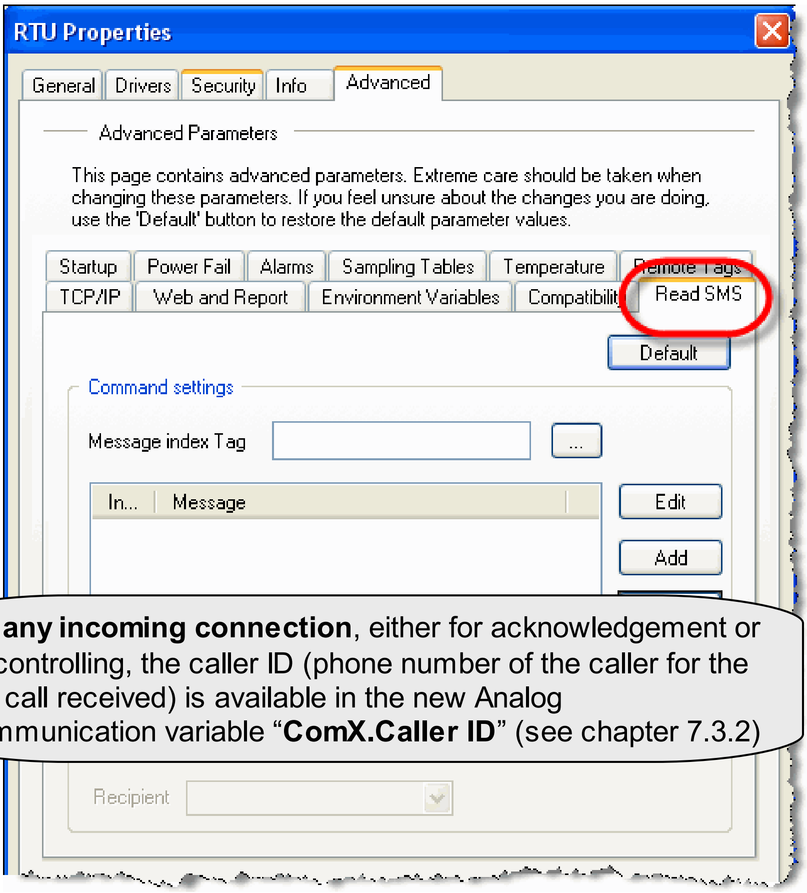
You can also click on the ‘Default’ button in GSM properties. If you work with a PIN code, be careful to adapt it.

Upload to OS 3.09.446 or higher (see chapter 4.8. “*Upload Operating System*”)

ReadSMS/POP3 features allow two uses:

1. **Acknowledgment** of an alarm by sending back a SMS to the RTU
2. **Controlling** the RTU by sending SMS message(s) or sending e-mail(s)

An advanced menu is available in the RTU properties:



This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

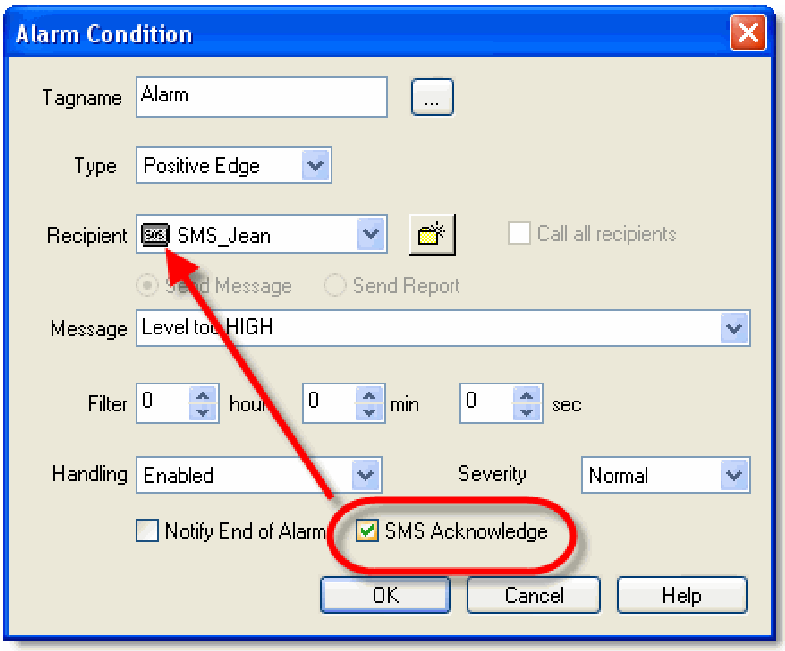
For **any incoming connection**, either for acknowledgement or for controlling, the caller ID (phone number of the caller for the last call received) is available in the new Analog Communication variable “**ComX.Caller ID**” (see chapter 7.3.2)

11.2. Acknowledgment of an alarm by sending SMS to the RTU

Two types of recipient may require an acknowledgment by SMS:

- Pager/SMS: sending a message through a SMS-C (standard way)
- E-mail: sending a message, which can be forwarded as SMS through a dedicated service

Alarm conditions associated to one of these recipients provide a new option: **SMS acknowledge**



Alarm Condition

Tagname: Alarm

Type: Positive Edge

Recipient: SMS_Jean

☐ Call all recipients

● Send Message ○ Send Report

Message: Level too HIGH

Filter: 0 hour 0 min 0 sec

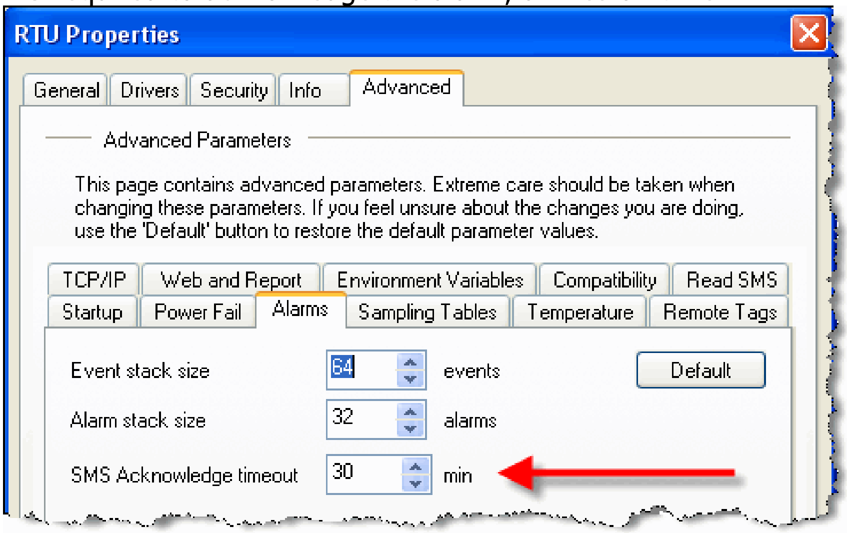
Handling: Enabled

Severity: Normal

☐ Notify End of Alarm ☑ SMS Acknowledge

Acknowledgment will be executed in 2 steps:

1. The sending of the message by the ***TBox MS*** (to the SMS-C or to the e-mail provider) will be first performed. Retries and time-out defined in the recipient will be used to determine the success or failure of this phase.
2. Then a second time-out, defined in the advanced 'Alarms' properties, will check if the incoming SMS required to acknowledge the alarm, arrives on time.



RTU Properties

Advanced Parameters

This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

Event stack size: 64 events

Alarm stack size: 32 alarms

SMS Acknowledge timeout: 30 min

The incoming SMS must arrive within this time-out for the alarm to be acknowledged. If not, a retry will be executed according to the definition in the Recipient. After the end of retries, the alarm will be considered as in error: auto-ack and the system variable 'AlaErr' at '1'.
<u>Working with 'Group of Recipients':</u>
- with option 'Call all recipients': all recipients have to acknowledge the alarm.
- without option 'Call all recipients': any recipient can acknowledge the alarm.

Don't set the time-out too short, to allow time for the SMS Center to send the SMS back to the CPU, in case the service is busy. Also, if the CPU is sending a SMS while an acknowledgment SMS is coming in, it will miss the warning from the MS-GSM module. The SMS will be stored in the SIM card and will be read at next auto-check from the CPU (max. 5 minutes).

11.2.1. Structure of the message

If the option 'SMS acknowledge' has been selected the RTU will send a header with the message including an identification number.

Example: **`#A00056# Level too HIGH`**

#	prefix (fixed).
A	precedes the absolute identification number of the alarm.
00056	absolute identification number of the alarm.
#	suffix (fixed).
message	message associated to the alarm.

11.2.2. Acknowledgment of the message

By sending **the same header syntax** to the RTU, you will acknowledge this specific alarm. Typically, this can be done using the option 'Reply' of the mobile. Verify that your mobile also sends the original message.

Example:

```
#A00056# Level too HIGH
      Reply: YES
```

The text sent to the RTU does not matter, as long as the syntax **#Axxxxx#** is sent.

Some Tags are very useful to monitor the acknowledgment of the alarms by SMS: AlaErr, SmsState, CallerID (see chapters 7.3 and 7.4).

11.3. Controlling the RTU using SMS message or reading e-mail using POP3

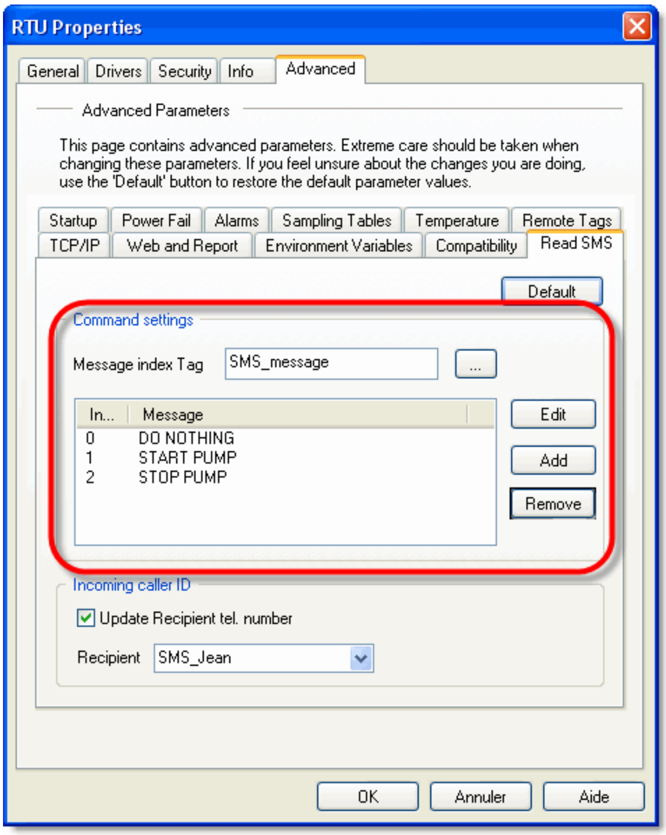
ReadSMS/POP3 provides the possibility to **control the RTU** by sending predefined SMS or by reading e-mail using POP3 service.

Details of the different possibilities:

1. Using pre-defined messages (-)

- From the ReadSMS properties menu, you select a '**Message index Tag**' (analog Tag - 16 bits format), that will contain a value associated to the message sent to the RTU
- You add the message(s) you intend to send to the RTU

When the RTU receives the message, it will put the corresponding value to the 'Message index Tag'



This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

Message index Tag: SMS_message

In...	Message
0	DO NOTHING
1	START PUMP
2	STOP PUMP

☑ Update Recipient tel. number

Recipient: SMS_Jean

<u>Notes:</u>
- SMS/POP3 message are not case sensitive
- This method of monitoring, using message, <u>**is the only method supported by POP3**</u>.

<u>**Message sent by SMS**</u>

A message can combine one or several data: Password, acknowledgment ID, writing values directly to ModBus addresses,...
It must always start and end with the character **#**

<u>*Examples:*</u>

```
#-START PUMP#
#P1568,A00056,-START PUMP,W20480=123#
```

The maximum number of messages supported is 20. In case you need to monitor more process, you can use the direct/indirect addressing (see next).

<u>**Message sent by e-mail**</u>

A message **must include the RTU Id** of the ***TBox LITE***, preceded by the letter `I` and a pre-defined message. It may also include an acknowledgment ID.
It must always start and end with the character **#**

<u>*Examples:*</u>

```
#I460000020107,-START PUMP#
#I460000020107,A00002,-START PUMP#
```

2. Writing Tag with Direct addressing (W)

You write a value directly to a ModBus address.

Syntax: **#Wmodbus address=value#**

Example: **#W20480=123#**
This message sent to the RTU will write value 123 to the analog Tag with ModBus address 20480

1. You can combine several texts, separated by a coma. For instance: **#W20480=123,W20481=456#**
2. ReadSMS checks the access protection level of the port before writing (see point 5. below) and also the 'Write' configuration of the 'Presentation' of the Tag (see chapter 8.4).

3. Writing Tag with Indirect addressing – analog (N)

You write a value directly to a ModBus address representing a pointer.

Syntax: **#Nmodbus address=value#**
The value at 'modbus address' corresponds to the ModBus address to write in

Example: **#N20480=123#**
If ModBus address 20480 contains the value 1000, the value 123 will be written to the ModBus address 1000.

We make a distinction between Target address corresponding to an analog Tag and a digital Tag (see next).
With **indirect addressing**, ReadSMS checks the access protection of the port (see point 5. below), but as it does not access directly the variable, is **unable to check the 'Write' configuration** of the 'Presentation' of the Tag (see chapter 8.4).

4. Writing Tag with Indirect addressing - digital (D)

You write a value directly to a ModBus address representing a pointer.

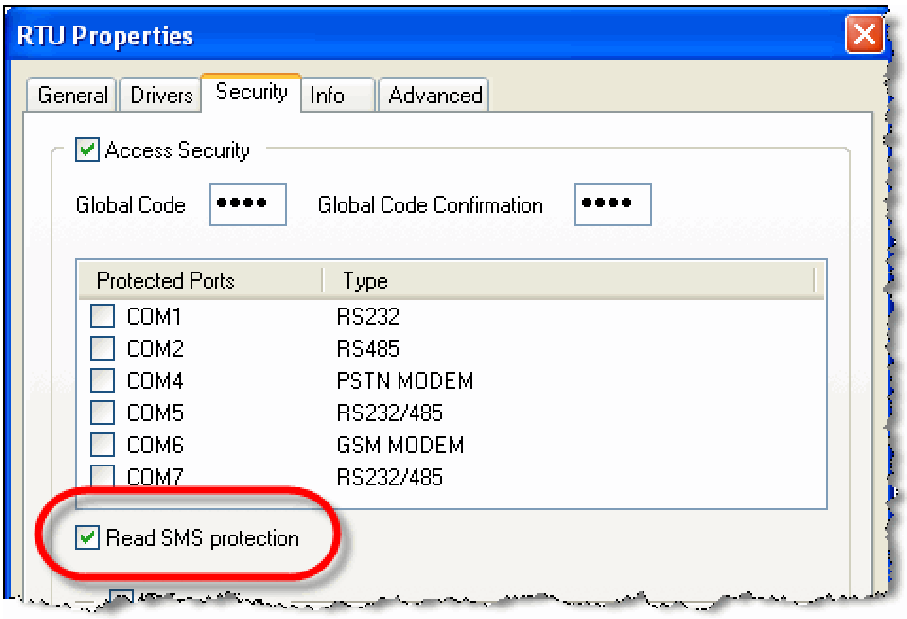
Syntax: **#Dmodbus address=value#**
The value at 'modbus address' corresponds to the ModBus address to write in

Example: **#D20481=1#**
If ModBus address 20481 contains the value 512, the value 1 will be written to the ModBus address 512.

5. Access protection (P)

ReadSMS access protection **is independent from the GSM port it is associated to**. In other words, even if the communication port is protected, ReadSMS will not specially be protected.

ReadSMS has its own independent access protection configuration, that can be activated from:
RTU properties
→ Security.



☑ Access Security

Global Code •••• Global Code Confirmation ••••

Protected Ports	Type
□ COM1	RS232
□ COM2	RS485
□ COM4	PSTN MODEM
□ COM5	RS232/485
□ COM6	GSM MODEM
□ COM7	RS232/485

☑ Read SMS protection

If ReadSMS protection is activated, a **login is required** in the SMS message.
The login is composed of **the last 8 digits** of telephone number of the mobile used to send the SMS and a **password**.

To obtain the Password, the utility 'Password Generator' is needed (Start → Programs → Techno Trade → Accessories → Password generator).

From the Password utility, you define:

- the <u>global code</u> used in the RTU
- as <u>NAME</u>: the last 8 numbers of the telephone number of the mobile to which the alarm message will be sent.
- as <u>Access Level</u>: Engineer (Level 3).

The resulting '**PASSWORD**' must be used to login.

<u>Syntax:</u> **`#Ppassword#`**

<u>Example:</u> **`#P1568#`**

If needed, the Password **must be declared first**
Acknowledgment (with code A) does not require password

6. Acknowledgment (A)

See chapter 11.2 above

7. SET a digital Tag (S)

You write 1 to a digital Tag using its ModBus address.

Syntax: **`#Smodbus address#`**

Example: `#S32#`
The digital Tag at ModBus address 32 will be set to 1.

ReadSMS checks the access protection level of the port before writing (see point 5. above) and also the 'Write' configuration of the 'Presentation' of the Tag (see chapter 8.4).

8. RESET a digital Tag (R)

You write 0 to a digital Tag using its ModBus address.

Syntax: **`#Rmodbus address#`**

Example: `#R32#`
The digital Tag at ModBus address 32 will be reset to 0.

ReadSMS checks the access protection level of the port before writing (see point 5. above) and also the 'Write' configuration of the 'Presentation' of the Tag (see chapter 8.4).

9. Changing a telephone number (T)

You change the telephone number of a recipient using its index number (see list of recipients in TWinSoft).

Syntax: **`#Tindex=telephone number#`**

Example: `#T05=0123456789#`
You replace the telephone number of recipient 5 with 0123456789.

1. Maximum length: 21 characters.
2. ReadSMS checks the access protection level of the port before writing (see point 5. above)

10. Writing minutes since midnight into a register (h)

To write in an analog register, the current number of minutes since midnight **at the moment the message is received**.

Syntax: **`#Wmodbus address=h#`**

Example: `#W20482=h#`
If the message is received at 15:23, the value 923 will be written at ModBus address 20482

ReadSMS checks the access protection level of the port before writing (see point 5. above) and also the 'Write' configuration of the 'Presentation' of the Tag (see chapter 8.4).

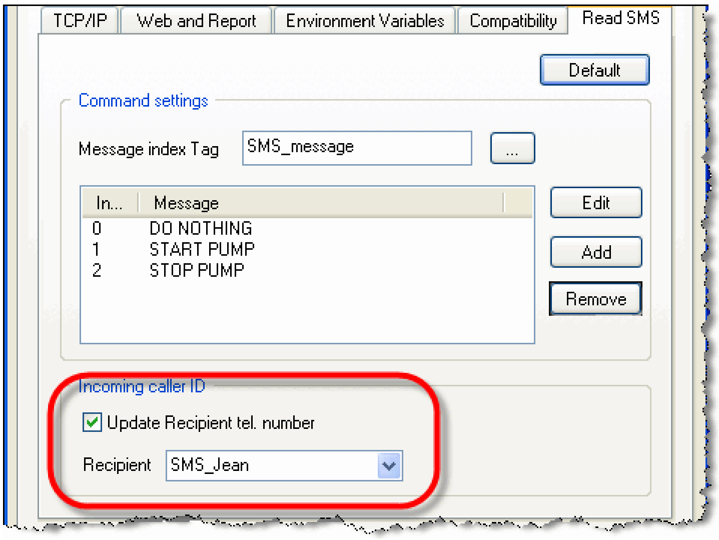
11.4. Automatic Update of a Recipient’s tel. number

An **existing recipient** of type ‘Pager/SMS’ can be **updated** with the **telephone number of the person calling the RTU**.

The idea is that the RTU verifies the message it receives (using the ReadSMS special register status - see next) and is able to send back a message to the originator.

ReadSMS uses the caller ID of the originator to update the recipient you select in this menu, with originator’s telephone number.

From the Process, you can then decide to send back an SMS, to confirm the order, to indicate the incoming message was invalid, that the password was incorrect, …



Message index Tag: SMS_message

In...	Message
0	DO NOTHING
1	START PUMP
2	STOP PUMP

☑ Update Recipient tel. number

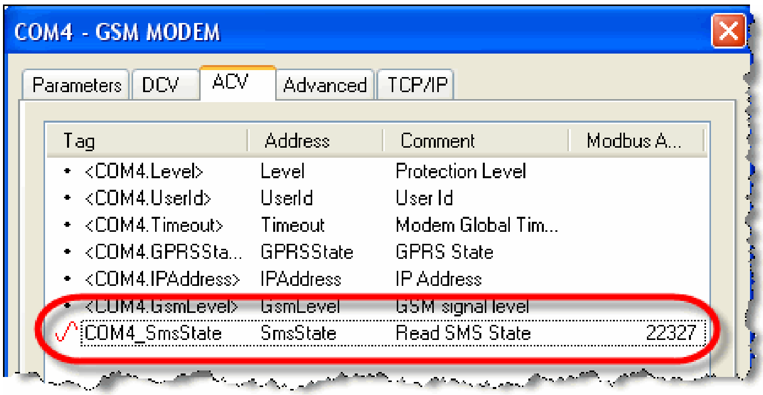
Recipient: SMS_Jean

If this option is activated, the selected recipient will be automatically updated with the telephone number of **any incoming call** (if caller ID of originator has been activated!).

11.5. ReadSMS status

A communication variable, associated to the MS-GSM can be used to check the status of ReadSMS.

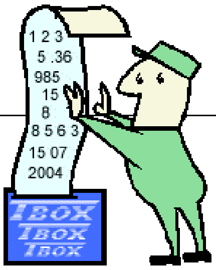
From the GSM Communication port, go to the tab ‘ACV’ and make a Tag of ‘**SmsState**’



Tag	Address	Comment	Modbus A...
• <COM4.Level>	Level	Protection Level	
• <COM4.UserId>	UserId	User Id	
• <COM4.Timeout>	Timeout	Modem Global Tim...	
• <COM4.GPRSSta...	GPRSState	GPRS State	
• <COM4.IPAddress>	IPAddress	IP Address	
• <COM4.GsmLevel>	GsmLevel	GSM signal level	
COM4_SmsState	SmsState	Read SMS State	22327

Value	Description
1	Accepted message received
2	Acknowledgment received
10	Invalid message
11	Unknown command
12	Equality character (=) not found or incorrect
20	Incorrect password
21	Incorrect password or not supplied for a com. Port protected
30	Message received does not match a predefined message
31	Writing to an unknown address
32	Writing to an unknown address, using indirect addr. (address contained in the Tag not known)
33	Changing the telephone number of an unknown recipient

12. Datalogging



12.1. Introduction

Datalogging allows **memorizing values of your process**, in order to visualize its history.

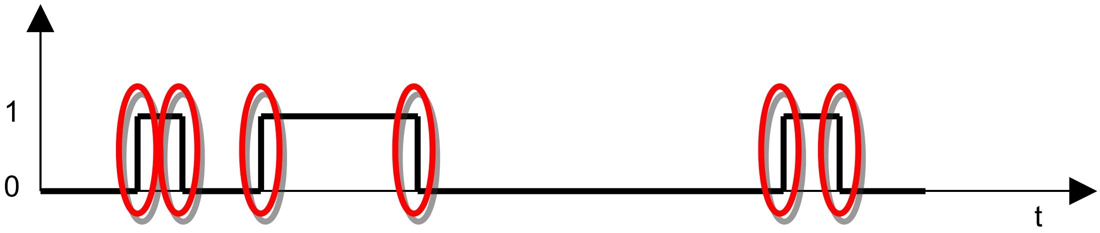
TBox MS contains memory for recording historical values of Tags and events (see technical specifications); the latter is what we call the **database** of *TBox MS*.

There are two categories of databases:

The Chronologies

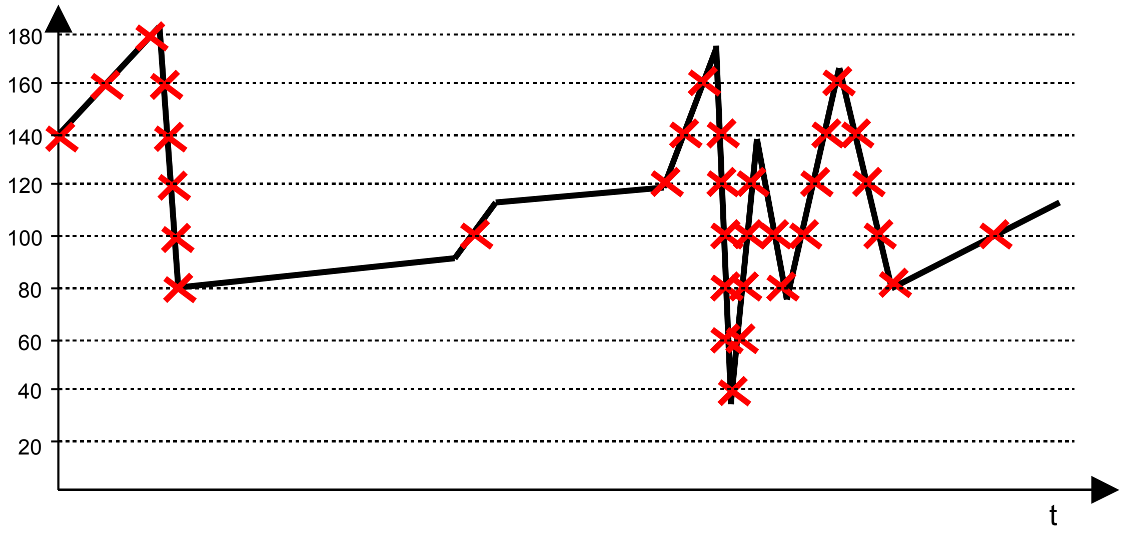
Chronologies are '**On event**' recordings, by mean of changes in Tags (also known as "Sequence of Events"). Each event is recorded with the time, date, Tag and its status or value.

Example of 'digital event':



The status changes of the Tag represent the events.

Example of 'analog events':



The variation of the Tag represents the events.

TBox MS stores chronologies in 2 tables: one for digital events and one for analog events. The size of the tables are defined in the ***General RTU properties***, as described chapter 6.1.

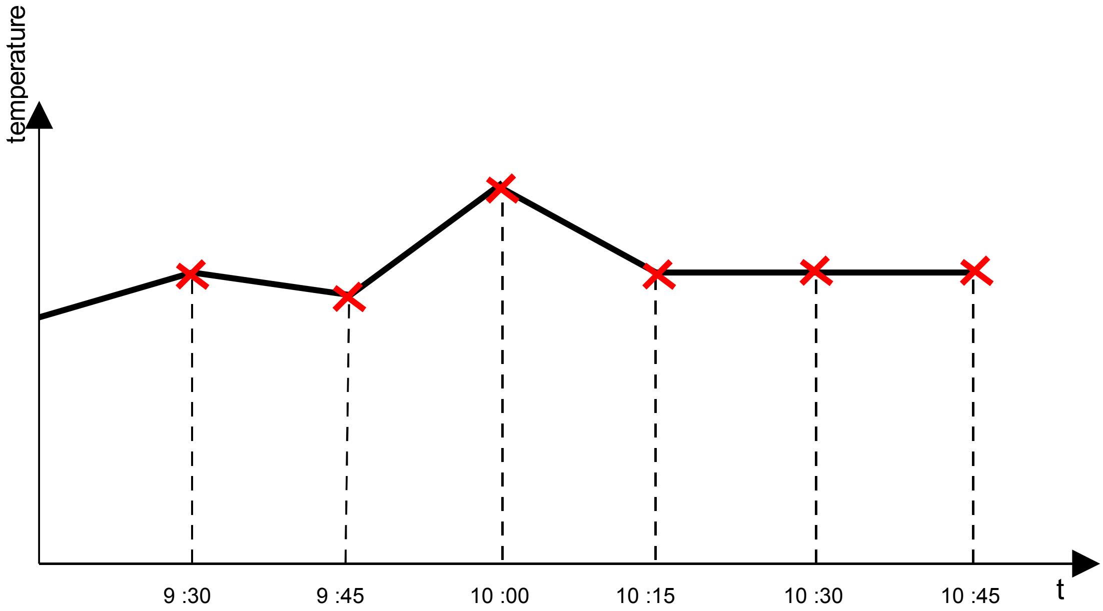
Recording into **chronologies** happens '**on event**', but the minimum resolution of **1 second** for MS-CPU16 and **1 millisecond** for MS-CPU32.
With MS-CPU16, in case of recording using Ladder/BASIC, with several records during the same second, the data is sorted with the chronological order (latest at the top) but with the same second.

The Sampling Tables.

Sampling tables use '**Periodical**' recording (minimum period = 1 second).
Recording in sampling tables happens at regular intervals and does not depend on signal variations; it uses the clock of the CPU to determine the recording.

Only the date and time of the last recording are stored, and they therefore require less memory than do chronologies.

Example of 'periodic recording':



Each Tag is recorded into a separate table. The maximum number of tables is 512 and the size of each table is limited to 65535 records.

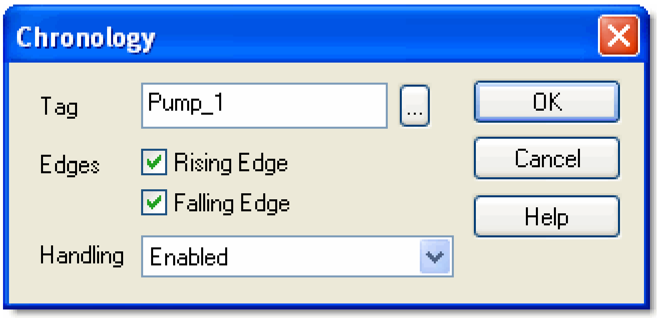
The database information recorded in ***TBox MS*** can be retrieved with the use of SCADA software such as *Tview* or other HMI package with 'TComm.dll' based driver (please call your distributor).

By doing a compilation you can check **the space of memory available** (see chapter 4.10.2).

12.2. *The chronologies*

12.2.1. Digital chronologies

Example of an entry in Digital chronology: **Recording of the starting and stopping of 'Pump_1'.**



Tag: Pump_1

Edges: ☑ Rising Edge ☑ Falling Edge

Handling: Enabled

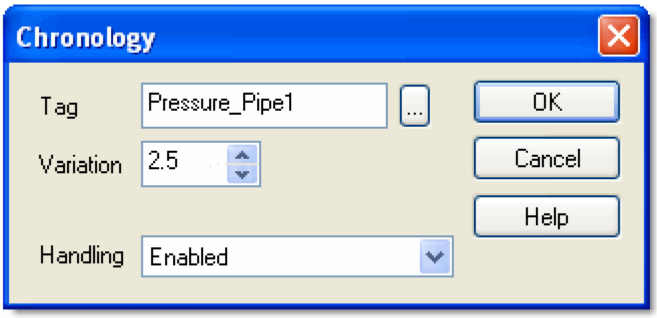
Edges: Recording on positive and (or) negative edge.

Handling:

- Enabled: always recorded.
- Disabled: never recorded.
- PowerF: recording disabled in case of main power failure.
- DisCRD: recording disabled when the system variable 'DisCRD' is at 1.

12.2.2. Analog chronologies

Example of an entry in Analog chronology: **Recording of a variation of 2.5 bars in 'Pressure_Pipe1' input.**



Tag: Pressure_Pipe1

Variation: 2.5

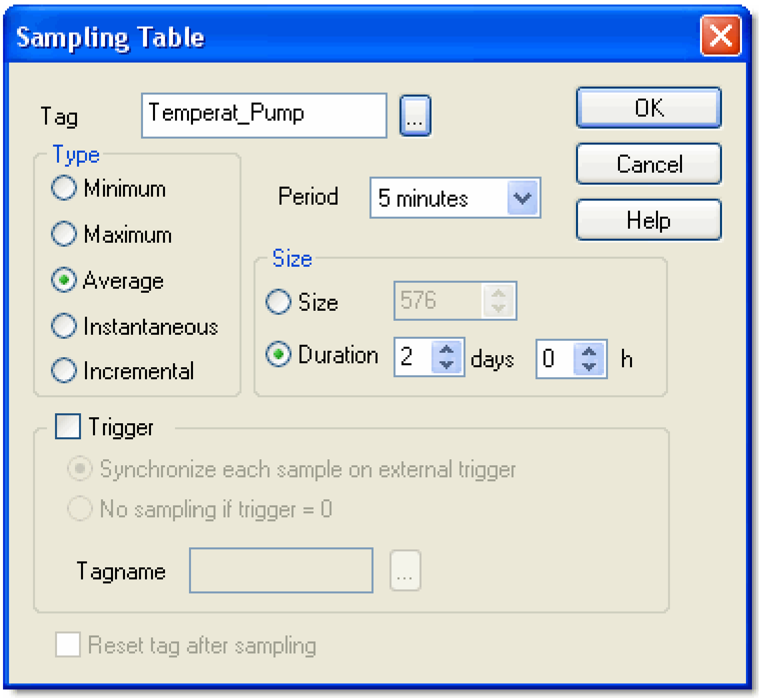
Handling: Enabled

Variation: Recording in case of variation (higher or lower) in comparison with the previous recording. The unit is expressed according to the format selected in the Tag definition (see chapter 8.2.2: ***Analog Tags***).

Handling:

- Enabled: always recorded.
- Disabled: never recorded.
- PowerF: recording disabled in case of main power failure.
- DisCRA: recording disabled when the system variable 'DisCRA' is at 1.

12.3. The sampling tables



Sampling Table

Tag: Temperat_Pump

Type: ○ Minimum ○ Maximum ● Average ○ Instantaneous ○ Incremental

Period: 5 minutes

Size: ○ Size 576 ● Duration 2 days 0 h

□ Trigger

● Synchronize each sample on external trigger

○ No sampling if trigger = 0

Tagname:

□ Reset tag after sampling

Type: ***TBox MS*** is able to execute calculations on a **minimum time-base of 1 second**. The result of the calculation is written in the sampling table after the period selected (see next).

This value can be:

- Minimum : minimum value during the period.
- Maximum : maximum value during the period.
- Average : arithmetic average value calculated during the period. For each period a new average is calculated.

Tag format	Limitation in recording
8 bits	All periods accepted
16 bits	Period limited to 12 hours
32 bits	Not available
Float	All periods accepted

- Instantaneous : value at the moment of the recording.
- Incremental : ***TBox MS*** records the difference between the current value and previously recorded value.

Example of incremental recording:

Value of the Tag	865	878	902	905	965	985
Incremental value recorded	…	13	24	3	60	20

Period Period Period Period Period Period

Period: Period between 2 recordings (calculated with the clock of the CPU). You may choose between:
1sec; 2sec; 4sec; 5sec; 10sec; 15sec; 30sec; 1min; 2min; 4min; 5min; 10min; 15min; 30min; 1h; 2h; 4h; 6h; 12h; 24h; 48h; daily; weekly; monthly.
The recording happens at 'birthday' time of the period selected.

Example: if you select as period *5 minutes*, the recording will be done at:
9:25:00; 9:30:00; 9:35:00; 9:40:00 ...

In case you wish to make recording every day, or even with a longer period the options are:

- daily: recording once a day
- weekly: recording once a week
- monthly: recording once per month.

The hour of the day, the day of the week and/or the month are defined once for all sampling tables in the RTU Advanced properties (see chapter 6.5.3)

Size: The size can be expressed on two ways:
Size: the number of records of the table.
The recording works on the FIFO principle. According to the size, the duration is updated automatically (see next).
MS-CPU16: the size can be of maximum 65535 records, with a total of 256 kbytes for sampling tables (as of S/N 010000 of MS-CPU16).
MS-CPU32: the size can be of maximum 65535 records, with a total of 1 Gbytes on SD card.
Duration : you may prefer to enter a number of days and hours, in this case the size is updated automatically.

To adjust the sizes check the available memory with the compile option. See chapter 4.10.2: ***Compiling a program***.

Trigger:

Synchronize each sample on external clock: the recording of the value is executed on the positive edge of the Tag selected, and **not with the clock of the CPU**.

The period between 2 pulses of the Trigger must correspond to a period between 2 recordings (see above). The latter is used when retrieving the data to compute timestamps using the last time stamps and the period.

Example of use of external Trigger: quarter - hour management.

In some industries, every 15 minutes (may vary slightly), your electric company sends an impulse that is used to calculate your consumption, based on average consumption during 15 minutes. You will be charged based on the **highest consumption.**

In order to analyze your consumption and prevent peaks in consumption, you can use this pulse as Trigger.

Recording will be done each time the pulse arrives, but when **retrieving data**, the calculation of timestamp will be computed from the time stamp of the last recording and the period.

This means it can only be used if the period between pulses corresponds to a period between 2 recordings (see above).

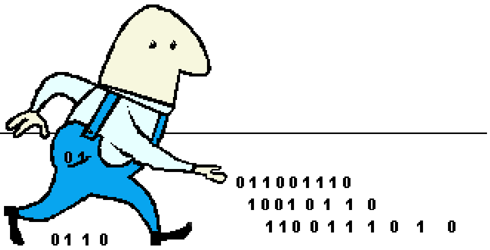
No sampling if trigger = 0: the CPU clock is used to record data (see 'Period' above), but the recording is only possible when the Tag Trigger is positive "high state". When it is negative, the recording stops. On the positive edge of the Tag, the table is erased and a new recording starts.

WARNING : At each activation of the Trigger, the table is erased. You then have to retrieve it before!
The reason is that Sampling Tables only store the timestamp of the last recording.

Reset Tag after sampling: if this option is checked, the RTU automatically resets the register that has been recorded.

This option works only with registers, NOT I/O !

13. Remote Tags



13.1. Introduction

Remote Tags allow exchanging information between two or more ModBus devices via any communication ports.

Typically, it is a ***TBox MS*** connected to another ***TBox MS***, either local (through RS485 or Ethernet) or remote, by modem.

One often speaks of 'Master Network' because it is a Master/Slave communication: the **Master executes reading and writing in slave(s)**.
TBox MS, being 'Master', reads and writes the variables with all other devices using the ModBus protocols (ModBus-RTU or ModBus/TCP, according to the remote device).

Each Remote Tag corresponds to **one transaction** (reading or writing) with 1 slave.

When there are several devices, ***TBox MS*** executes the different transactions in the order of the list of the Remote Devices and then for each device, in the order of the list of Remote Tags.

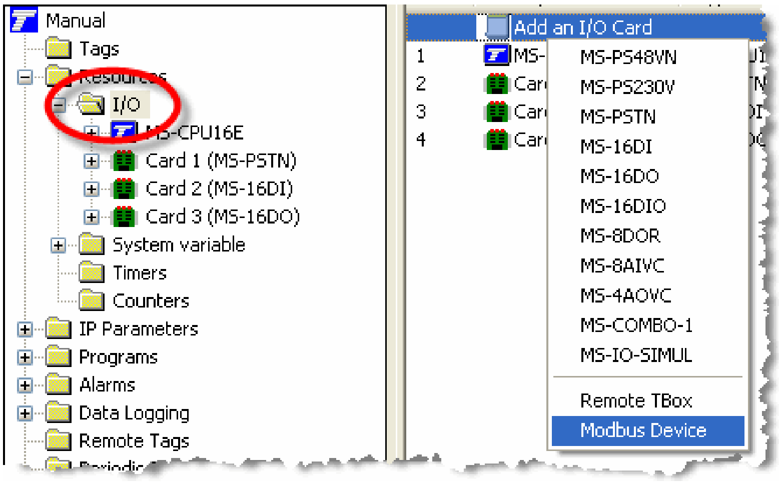
Any communication port can be used to execute Remote Tags: RS232, RS485, modem PSTN, modem GSM, Ethernet.
When a **modem port** is used to execute Remote Tags, ***TBox MS*** needs first to establish the connection using an **Alarm** of type '**ModBus**' (see chapter 10.4. ***Recipients***)

Before creating a Remote Tag you have to create the equipment you are going to communicate with.

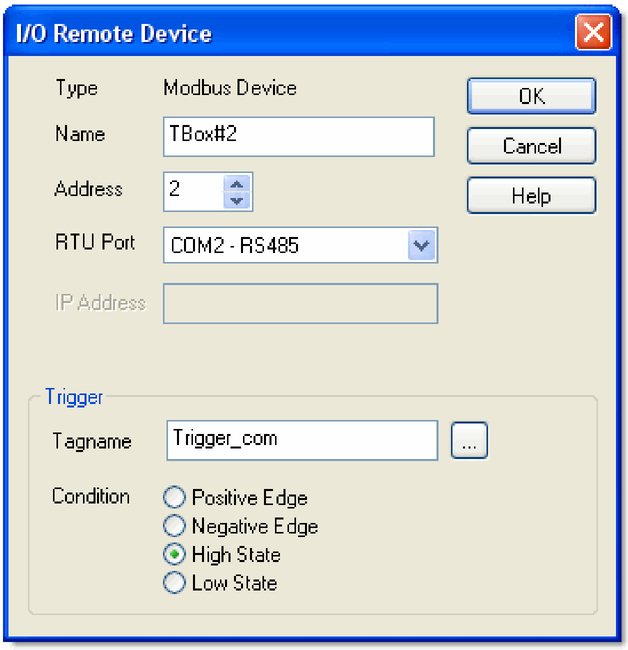
13.2. Creating a Remote Device

From the Project Workspace, select 'Resources' → 'I/O'. Click 'I/O' and in the list of I/O, click 'Add an I/O card'.

Remote TBox: a ***TBOX*** (CPU-3)
ModBus device: a ***TBox MS***, ***TBox LITE*** or any ModBus device



Example with a remote ***TBox MS***.



I/O Remote Device

Type: Modbus Device

Name: TBox#2

Address: 2

RTU Port: COM2 - RS485

IP Address:

Trigger

Tagname: Trigger_com

Condition:
○ Positive Edge
○ Negative Edge
● High State
○ Low State

Name: You type any name. It will be available in a list of available equipment when creating 'Remote Tags' (see next).

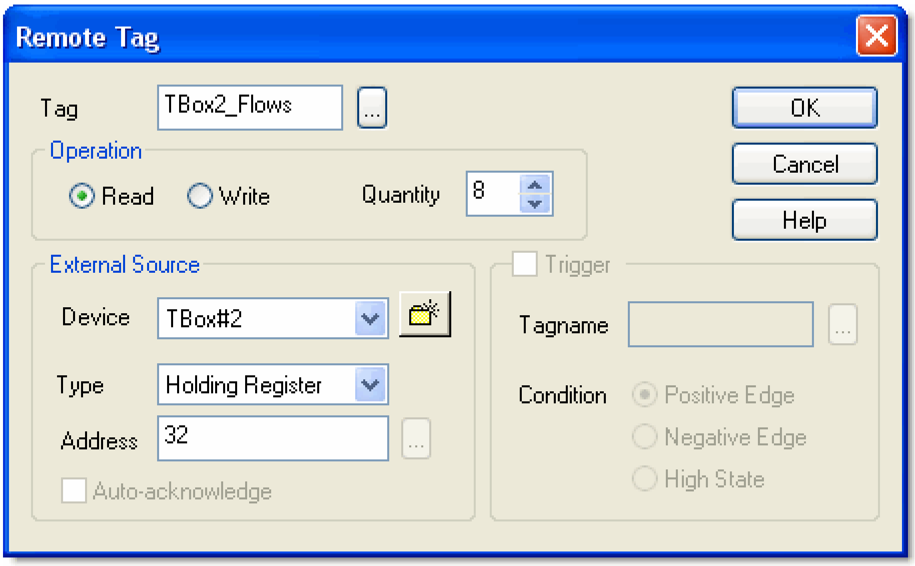
Address: It is the ModBus address of the Remote equipment. **It must be different from the *TBox MS* and possible other equipment on the same network.**

RTU Port: The communication port used by ***TBox MS*** to communicate with the remote equipment.

Trigger: Select a digital Tag that will trigger the communication, according to a 'Condition' (see next). Working with several equipment, you can declare different Tags and then control differently the communication to each equipment.
The Trigger must be a digital variable (DIV).

Condition: Condition of Tag 'Trigger' to start communication. Typically, you will work with a **permanent connection** (Trigger in High or Low state). Or you can decide to execute one-shot communication, on edge changing of the Tag Trigger.
The changing of state of the Tag can be controlled by BASIC, Ladder, or Periodic events.

13.3. Creating a Remote Tag



Tag: TBox2_Flows

Operation: ● Read ○ Write Quantity: 8

External Source: Device: TBox#2; Type: Holding Register; Address: 32; □ Auto-acknowledge

□ Trigger: Tagname: ; Condition: ● Positive Edge ○ Negative Edge ○ High State

Example: reading of 8 'floating' variables in TBox#2 at address 32

Tag: Select an existing Tag by clicking the … button. Be sure you select a Tag of the same type of the address you want to access in the 'Slave' (Byte, Word, DWord or Float).
If the Tag does not exist, you can create it after having clicked the button. It is the Tag of the **Master**; it contains the value you want to write in a Slave or it is a register that contains the value that Master reads in a Slave.
In case of block communication (with a quantity > 1), this Tag is the one of first ModBus address.

Operation :

Operations	MASTER (Tag)	SLAVE (Address)
READ	←	—
WRITE	—	→

Read : the Master executes a reading in the Slave.
Write : the Master executes a writing to the Slave.

Quantity : Quantity of variables of successive addresses that are read (or written) in the Slave. It depends on the External source, the types of variable and the ModBus function used (see tables below).

ModBus protocol handles only words (16 bits). When working with 32 bits, TWinSoft adapts the quantity to double the number of words.
32 bits are handled with:
<Hi word1><Lo word1><Hi word2><Lo word2>…

External Source. All the following parameters concern the Slave station:

Device: select an existing external device from the 'Resources'. You can create one clicking the button

Type: select the type of the external variable. According to the external source, the choices are:

With external source '**ModBus device**' (*TBox MS*, *TBox LITE*, any ModBus device)

Types	Connection in remote device	ModBus Function
Digital input	Only digital input(s)	2
Coil	Digital output(s) or register(s)	1, 5 or 15
Analog input	Only analog input(s)	4
Holding register	Analog output(s) or register(s)	3, 6 or 16

Operations	Types	ModBus Functions	Max. Quantity (*)
Read Digital	Digital Input	2	**1600** (**see Warning below**)
Read Digital	Coil	1	**1600** (**see Warning below**)
Read Analog	Analog Input	4	**125** (16 bits) - **62** (32 bits)
Read Analog	Holding Register	3	**125** (16 bits) - **62** (32 bits)
Write Single Digital	Coil	5	**1**
Write Single Analog	Holding Register	6	**1** (16 bits)
Write Multiple Digital	Coil	15	**800** (**see Warning below**)
Write Multiple Analog	Holding Register	16	**100** (16 bits) - **50** (32 bits)

(*): Maximum quantities for ***TBox MS***. You also have to check the maximum quantities of the 'Remote device' -they could be less.

With External source '**Remote TBox**' (TBOX CPU-3)

Description	Operations	Tag types	Max. Quantity
Digital I/O	Read/Write	IOD, T4m	16
Analog I/O	Read/Write	IOW, I4M	8
Digital registers	Read/Write	DIR, STD	1600 (**see Warning below**)
Analog registers (8 bits)	Read/Write	STB	8
Analog registers (16 bits)	Read/Write	AIR, STO	100
Analog registers (32 bits)	Read/Write	TOT	8
Analog registers (32 bits)	Read/Write	FLT	8
Timers	Read/Write	ATP, ATV, DTI	16
Counters	Read/Write	ACP, ACV, DCN	16
Special Registers	Read/Write	DSPE, ASPE	16
Register 'Sampling Table'	Read/Write	ECH	16

(*): with quantity > 16, ModBus addresses and quantities must be multiple of 8

When working with **digital variables** (DIV, DIR, …), you have to use **multiples of 8 for: quantity, address of the Tag and Address in External Source**

Address : The ModBus address must be typed according to the indication of the user's guide of the Remote device.
Communicating to ***TBox MS***, you have to refer to the TWinSoft application and its configuration of Tags.

13.4. Remote Tags through modem

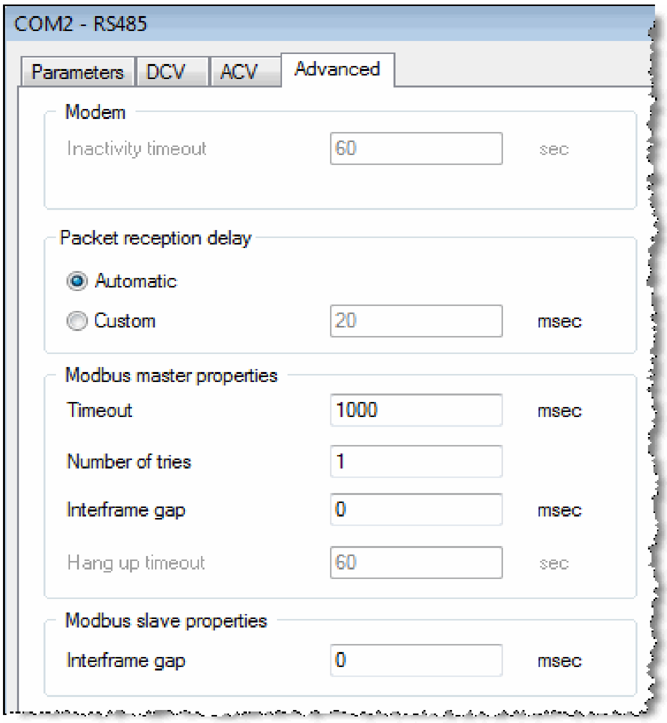
With a remote device accessed by modem, the connection must be first established **using an Alarm**.

The sequence is the following:

- Create a *Remote Device*, associated to the communication port of the modem and to a Trigger – DIV (digital register) **always active**.
- Create the *Remote Tags* associated to this device.
- Create an *Alarm Recipient* of type 'ModBus - Master', with the telephone number of the remote device.
- Create an *Alarm Condition*, associated to the event requiring communication with the Remote TBox and to the Recipient created above.
- When TBox needs to communicate, generate the alarm condition.
- **When modems are connected** (can be checked using the communication variable DCV – Comx.Call) **and Trigger is active (see above)** Remote Tags associated to this station will be executed.
- Acknowledge the alarm, for instance using the special analog variable 'AlaRec'.
- Stop connection by writing '0' to the Communication Variable 'COMx.ModemOffHook', alternatively, communication will be automatically stopped after 1 minute.

13.5. Timing configuration of Remote Tags

Several timings can be adjusted when communication through Remote Tags. Their value mostly depends on the media and the baudrate (see on line help for more info).
They are available from the tab 'Advanced' of the properties of the communication port .



Modem
Inactivity timeout 60 sec

Packet reception delay
● Automatic
○ Custom 20 msec

Modbus master properties
Timeout 1000 msec
Number of tries 1
Interframe gap 0 msec
Hang up timeout 60 sec

Modbus slave properties
Interframe gap 0 msec

Packet reception delay: maximum time for receiving a valid frame.

ModBus Master Properties
timeout: maximum time to receive an answer before sending the next query

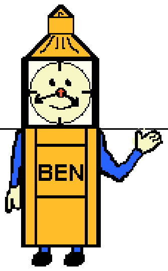
Number of Tries: in case of error, number of times a query is sent

Interframe gap: after having received a valid answer, time before sending the next query.

ModBus Slave Properties
Interframe gap: after having received a valid request, time before sending the answer.

Example with RS485 of the CPU

14. Periodic Events



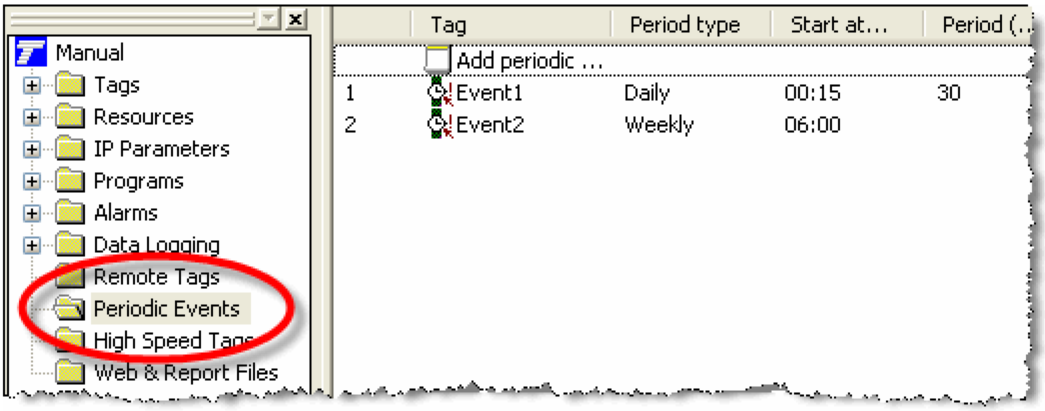
When **periodical tasks** have to be executed, periodical events constitute an easy way of **creating events** to launch the tasks, like Remote Tags, send of test alarm, datalogging, a piece of Ladder/BASIC logic, etc..., and this, independently of any other condition.

A periodic event could be compared to an automatic timer.

A digital Tag is used to trigger the event(s).
It is SET by the Operating System of ***TBox MS*** when the task(s) must be carried out and RESET by the OS when the task(s) have been launched.

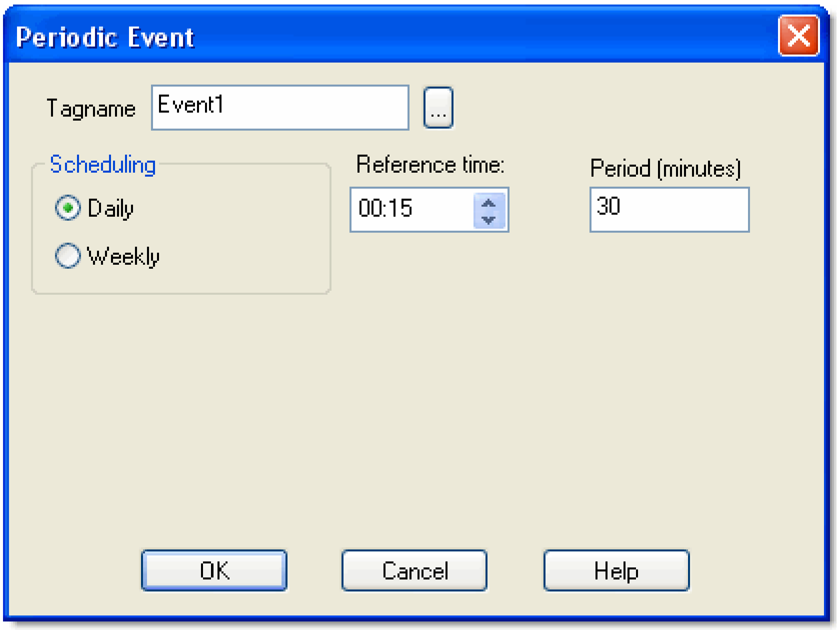
Several tasks can be associated to the Tag triggered. This implies for the OS to RESET the Tag when all event s have been launched.

In the project workspace of TWinSoft, a folder is available to declare the Periodic Events:



	Tag	Period type	Start at...	Period (...
	Add periodic ...			
1	Event1	Daily	00:15	30
2	Event2	Weekly	06:00	

Example of a 'daily event':



Periodic Event

Tagname: Event1

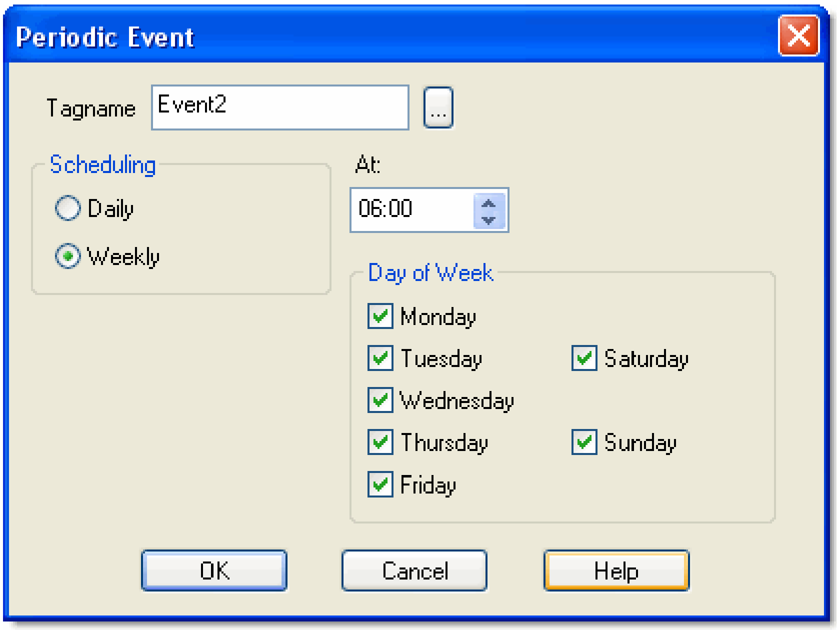
Scheduling: ● Daily ○ Weekly

Reference time: 00:15

Period (minutes): 30

The Tag 'event1' (a DIV) will be automatically SET every 30 minutes, at each xx:15:00 and xx:45:00.
The task(s) associated to 'Event1' will be generated every 30 minutes.

Example of a 'weekly event':



Periodic Event

Tagname: Event2

Scheduling: ○ Daily ● Weekly

At: 06:00

Day of Week: ☑ Monday ☑ Tuesday ☑ Wednesday ☑ Thursday ☑ Friday ☑ Saturday ☑ Sunday

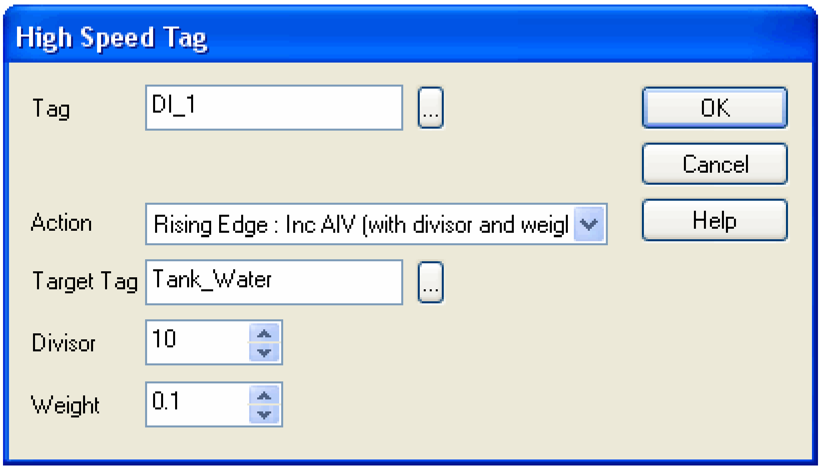
The Tag 'event2' (a DIV) will be automatically SET every day at 6:00:00 AM.
The task(s) associated 'Event2' will be generated at that moment.

15. High Speed Tags

The high-speed Tags were designed to receive pulses on digital inputs, with handling **independent from the cycle of Ladder/BASIC logic**.
If the delay between two successive pulses is smaller than the cycle time of the process, it will not be possible, for instance, to make counting from the program. **Then you can use the High Speed Tags**.

This feature is available for maximum **1 group of 8 digital inputs** and the maximum frequency of pulses is limited to 25 Hz with a duty cycle of 50 %.

When a pulse is detected, it is handled on processor interrupt.



Tag: DI_1

Action: Rising Edge : Inc AIV (with divisor and weigl

Target Tag: Tank_Water

Divisor: 10

Weight: 0.1

Tag: Select an existing Digital Tag by clicking the ... button. If the Tag does not exist, you can create it after clicking the button.

Action: Action taken to the Target Tag (see next) after a status change of the digital Tag defined above. The choices are:

- Rising Edge -> Set (DIV): each rising edge of the digital Tag, performs a SET action on the Target Tag which must be an internal variable DIV.
- Falling Edge -> Set (DIV): each falling edge of the digital Tag, performs a SET action on the Target Tag which must be an internal variable DIV.
- Rising Edge -> Inc (AIV): each rising edge of the digital Tag, increments the Target Tag which must be an internal variable AIV.
- Falling Edge -> Inc (AIV): each falling edge of the digital Tag, increments the Target Tag which must be an internal variable AIV.

Target Tag: It is the internal variable (DIV or AIV) on which the action is taken (see above).

Divisor: Division Factor that allows the action (SET or increment) to occur once every x pulses (x being the factor of division).

Weighting: You can give a weight to the pulses, **after the computing** according to the Divisor (see above).
If the weight is smaller than 1 (0.1, 0.2, …) be sure the Target Tag is of type 'Float'.

Example: counting water consumption
- you receive pulses each 10 liters
- you want to count each 100 liters
- you want to display the result in m³
***Divisor:** 10*
***Weight:** 0.1*

15.1. MS-CPU16: Processor time for executing High Speed Tag

This table shows the time needed by the processor to compute the High Speed Tags according to the **frequency** of the pulses, the **type** of the Target Tag and **quantity** of High Speed Tag.

	Frequency of pulses	
Target Tag	**0 Hz**	**25 Hz**
1 x DIV	24 µs	64 µs
8 x DIV	90 µs	420 µs
1 x AIV	24 µs	220 µs
8 x AIV	90 µs	1460 µs

16. Access security

This (optional) access security of the ***TBox MS*** prevents non-authorized persons from accessing the RTU and from opening the TWinSoft document.

If the Access security option is activated, each port of the ***TBox MS*** can be independently protected.
Once you activate the "Access security" option, the TWinSoft document will also be protected, even if no port has been selected!

The standard port protection concerns 'ModBus' protocol, on serial and modem ports.
A protection on Ethernet connection is also available as of TWinSoft 10.03 and OS 3.17.

The protection is based on a four-digit hexadecimal global code that is saved in the ***TBox MS***. This code is used as root for controlling different logins and access levels to the ***TBox MS***.

Three access levels are available to access protected port(s) of ***TBox MS***:

- Level 1: Surveillance mode or **VISUALIZATION MODE**. The operator can view all ***TBox MS*** values (local or remote), but cannot execute any command.
- Level 2: **COMMAND MODE**, the operator can view all the values and execute commands (locally or remotely). Also known as **READ/WRITE MODE**.
- Level 3: **ENGINEER MODE**, the operator can view all the values, execute commands and send new application (locally or remotely).

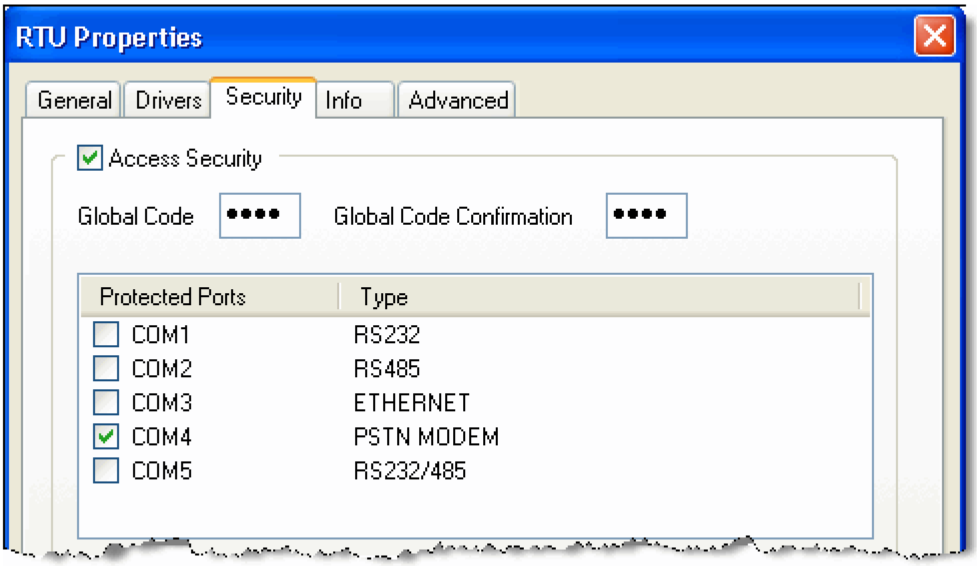
16.1. RTU configuration

The configuration of security of *TBox MS* is available from the 'RTU properties':

- there is a general activation of the protection.
- for each serial or modem port, you activate the protection.

16.1.1. RTU Properties

From the RTU properties → tab 'Security', **you activate the general access security feature**.



☑ Access Security

Global Code: ●●●● Global Code Confirmation: ●●●●

Protected Ports	Type
☐ COM1	RS232
☐ COM2	RS485
☐ COM3	ETHERNET
☑ COM4	PSTN MODEM
☐ COM5	RS232/485

Global code type in the code you used to generate the Access Codes with the utility **PASSWORD.EXE** (see chapter 16.3 following).
Type it a second time in the Confirmation field, to be sure.

TWinSoft presents you all the communication ports according to your hardware configuration.

Next, you check the port you want to be protected.

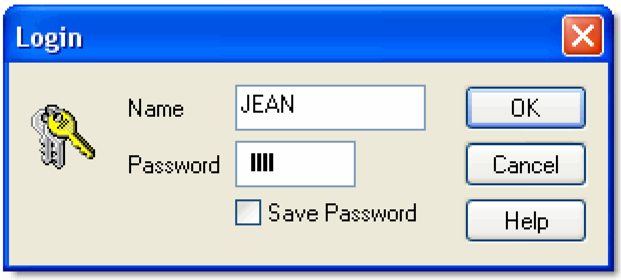
16.1.2. Port Properties

Access level on serial and modem ports can be checked using the Communication Variables (see chapter 7.3).

16.2. TWinSoft document protected

Opening a protected document

1. Once a document has been protected (see above), when opening it with TWinSoft, you are prompted to type a login.



Login

Name: JEAN

Password: IIII

□ Save Password

2. Type the NAME and PASSWORD you have created with the Password generator (see below)

3. Click OK

- The different access levels are not supported when opening a document. Any acceptable login will be supported.
- If you click 'Cancel', TWinSoft will indicate the document is protected and will open a new document

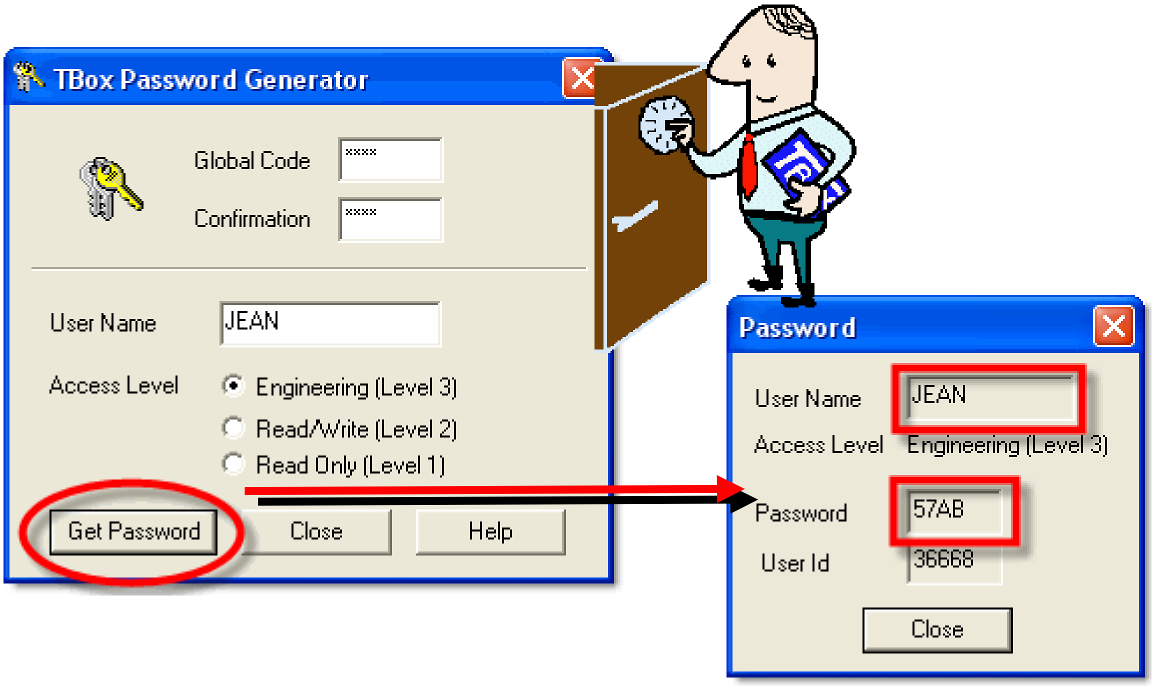
The utility program ***Password*** generates **access codes**.

16.3. Password utility

When installing *TWinSoft Suite* a password-creation program named **PASSWORD** is installed in the same directory as TWinSoft. It can be started from the 'Start' button of Windows and is located in the group of programs "Techno Trade" → "Accessories" created while installing TWinSoft.

This program generates a password that will be necessary to Login to the ***TBox MS*** (see next).

This password is composed of 4 hexadecimal characters in response to information related to the user. It is based on a complex algorithm using the **global code**, the **user's name** and the **access level**. A 5-digit number that identifies persons who have accessed the ***TBox MS*** accompanies the password. This information can be used to trace users for example by inserting this number into a database, with the help of Analog Communication Variables (see chapter 7.3).



TBox Password Generator

Global Code ****

Confirmation ****

User Name JEAN

Access Level
● Engineering (Level 3)
○ Read/Write (Level 2)
○ Read Only (Level 1)

Password

User Name JEAN

Access Level Engineering (Level 3)

Password 57AB

User Id 36668

Global code This hexadecimal code of 4 characters is the basis for password generation. It is typed in the 'RTU Properties' (see above) of TWinSoft and sent to the ***TBox MS***. When a user logs in, ***TBox MS*** checks whether NAME and PASSWORD fit with the global code. This means that if different users with different access levels must communicate with ***TBox MS***, the **global code used to generate passwords must be the same**.

User name The **NAME** you use as login.

Access level Three access levels are available:

- Level 1: Surveillance mode or VISUALIZATION MODE. The operator can view all ***TBox MS*** values (local or remote), but can not execute any command.
- Level 2: COMMAND MODE, the operator can view all the values and execute commands (locally or remotely).
- Level 3: ENGINEER MODE, the operator can view all the values and execute commands and alter or send new TWinSoft documents (locally or remotely).

When this information has been entered, click on the button "Get password".

Two codes have been created:

- *The PASSWORD:* this **PASSWORD** must be used together with the **NAME** when logging in.
- *The USER ID:* this number is available in an Analog Communication Variable when a user is connected to a port of ***TBox MS*** that is protected.

16.4. Login/Logout

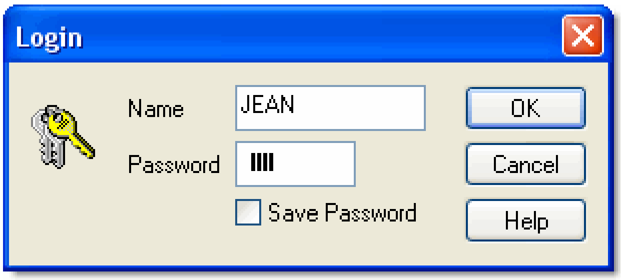
16.4.1. With TWinSoft

The Login feature of TWinSoft allows connecting to a protected port of the ***TBox MS*** according to an access level. If a port is not protected, access level is automatically 3: Engineer.

The Login/Logout is executed from the main menu bar → 'Tools'.

Login

If connected to a port of ***TBox MS*** that is protected, you need to Login to get an access level.



Login

Name: JEAN

Password: IIII

□ Save Password

You type the Name you used in the 'Password' utility and the Password that was created (see previous). According to those, you are in:

- Read only mode
- Read/write mode
- Engineer

The access level is displayed in the Status bar.

☑ If 'Save password' is checked and TWinSoft is connected to a protected port: when TWinSoft starts, it uses the access level corresponding to the password saved (see the status line).
If it is not checked and TWinSoft is connected to a protected port: TWinSoft starts in 'Read only' mode. You need to do a Login to get your access level.

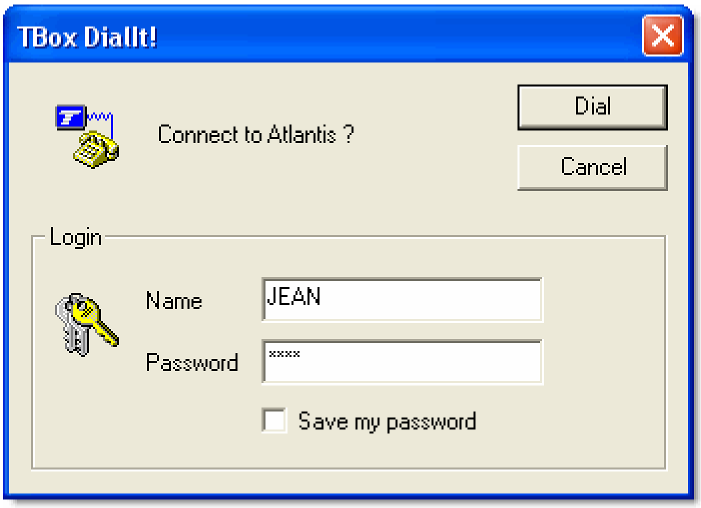
Logout
If the TWinSoft is connected to a protected port, the Logout sets TWinSoft in 'Read only' mode.

16.4.2. With Internet Explorer

Through a modem connection, you can access ***TBox MS*** as Web Server.

From Internet Explorer, you use the tool **TBox Dial It!** to dial ***TBox MS*** directly. ***TBox MS*** is then considered first as an **ISP** and then as a Web Server.

To connect to an ISP you need to login.



TBox DialIt!

Connect to Atlantis ?

Login

Name: JEAN

Password: ****

□ Save my password

You type the **NAME** and **PASSWORD** you have used with password utility (see above)

Even if ***TBox MS*** is not protected, type a **NAME** and **PASSWORD**.
Depending on Windows and IE version, **they will not allow a connection without login**.

16.5. Deactivating protection of *TBox MS*

There are two methods of deactivating ***TBox MS*** access protection:

Global reset (see chapter 4.7)
The first method is by performing a global reset, which must be done on site. When the program has stopped, the **local port is no longer protected**.

If a card 'modem' has been declared protected, it will still be protected even after a global reset. To deactivate the protection, an unprotected TWinSoft document must be sent to ***TBox MS*** (see below).

Sending an unprotected TWinSoft document
The second method involves modifying the TWinSoft document and deactivating the Access Security option. The document must then be sent to the ***TBox MS*** after having done a Login as 'Engineer'.

16.6. Deactivating protection of TWinSoft document

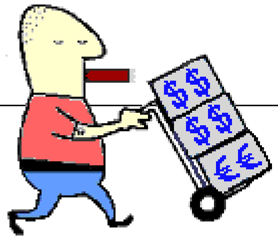
You have to open the document and deactivate 'Access security' in tab 'Security (RTU properties)'.

If you have forgotten your login, but still remember the Global Code, you can generate a new login (see chapter 16.3 above).

If you have forgotten your login and the Global Code, you have to contact your local distributor and send him the application, the .TWS file.

APPENDIXES

Appendix A. Licenses



The software itself is not protected; it can be installed on any PC and used to develop TWinSoft document (online or offline) and to monitor ***TBox MS***.

The only operation protected is the sending of an application to ***TBox MS***.

In order to find the best way for you we offer different possibilities:

A.1. The Evaluation mode

You don't need any software or hardware dongle. You are able to develop a complete ***TBoxMS*** project without any restriction, but when you send the application to ***TBox MS***, it will stop after 2 hours. This is a good solution for testing programs or creating a demo.

A.2. The Dongle

It is a hardware device placed **on your PC**. The dongle consists in a **USB key**. TWinSoft regularly checks the presence of it. It allows you sending applications to as many ***TBox MS*** as you want, with any PC.

A.3. The Code (License)

Available from the menu 'Help' → 'License Register.'
Using information of the PC (the Company name, the User name, a Serial Number), we create a code that you enter in the 'License' field. Once entered, you can send any application as if you had a dongle (see previous).
The only restriction is that it must **always be on the same PC**.
If you wish to use another PC, you have the possibility to remove registration on the first PC and register back on the second.

A.4. The TWinSoft LITE

Available from the menu 'Help' → 'TWinSoft Lite configuration.'
This protection mode is ideal for users having one or two ***TBox MS*** units. The dongle or a license might be too expensive.
TWinSoft LITE code is linked to one ***TBox MS***; it allows you sending an application to the ***TBox MS*** for which you have the code.

Appendix B. Time in RTU

One of the biggest issues in Telemetry and data logging equipment is the handling of time.
In order to have a universal solution, wherever the ***TBox MS*** is used, TWinSoft, OS of the RTU and 'Windows' collecting data, shares the mechanism of time management.

Time in the RTU is based on UTC time.

B.1. Time in TBox MS

The RTC (Real Time Clock)

The ***TBox MS*** is equipped with a RTC chip (Real Time Clock). The RTC is used to manage all times internally.

Functions of the RTC:

- it is a calendar Y2000 compatible.
- it updates the UTC time (see next).
- it communicates with OS to handle the UTC time, used for data logging.

The RTC time is used at start-up of ***TBox MS*** to update the UTC.

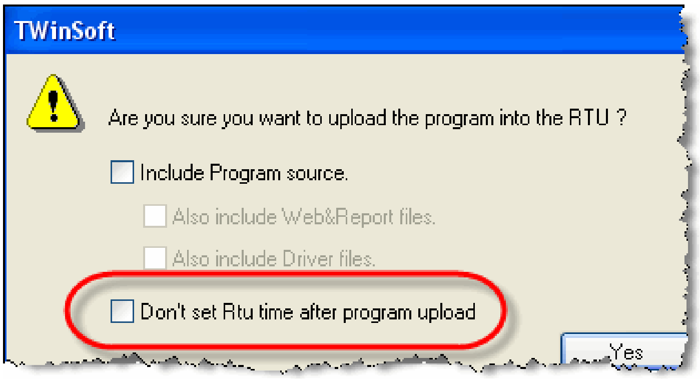
UTC Time

UTC time is based on the number of seconds since 1/1/1970 at Greenwich latitude. It is used as internal time stamp to each event (alarm, datalogging, …)
The UTC time is converted into Analog System Registers to give access to time information: second, minute, hour, day, month, year.
Changing UTC time automatically updates the RTC.
If time information is sent (in a report, as header of an e-mail, in the Analog System Register), it is always computed using the UTC time, according to the time settings in the 'General' RTU properties.

TBox MS Time setting

In order to set ***TBox MS*** to PC time, an option is available in the 'Communication' menu of the main menu bar; option available when connected (locally or remotely) to the RTU

When sending an application to ***TBox MS***, TWinSoft updates automatically the RTU time to the PC time.
This feature can be deactivated from the 'Send application' menu.


TWinSoft

Are you sure you want to upload the program into the RTU ?

□ Include Program source.

□ Also include Web&Report files.

□ Also include Driver files.

□ Don't set Rtu time after program upload

RTU time can be checked any time doing a RTU Identification, from the main 'Communication' menu.

Winter/Summer time

When installed in regions using daylight saving, the ***TBox MS*** handles the changes automatically.
It means that the **RTC** and **Analog System Variable [hour]** are automatically updated when the time changes.

Standard changing time and period:

- last Sunday of October: 1:00 → 2:00
- last Sunday of March: 2:00 → 1:00

B.2. Data logging

Chronologies

In chronologies, the time is recorded for each log of data. The time recorded is the UTC time.
When retrieving the data, the PC reads the UTC time and converts it according to the local time of the PC, depending on the Time settings of the PC.
When a winter/summer time change occurs, the ***TBox MS*** is informed and automatically updates all timestamps following the changing.

Sampling tables

In sampling tables, the ***TBox MS*** records the timestamp of the last record only. The other timestamps are built up when retrieving the data.
A choice had to be made between: either having always the same period of recording or having always the same 'hour' of recording. The latter has been chosen. When a winter/summer time change occurs, the target time is automatically updated for sampling tables having a period > 1 hour.
Example:
If recording a value once a day at 6.00 in the morning, the recording will always happen at 6.00, but when changing from winter to summer, the sampling period will be 23 hours and when changing from summer to winter the period will be 25 hours.

Periodic events

When a periodic event is defined with a period > 1 hour, its target time is automatically adjusted when a changing winter/summer happens.

B.3. System variables associated

Some System Variables of *TBox MS* are associated to the Time. They can be used in BASIC / Ladder programming to execute specific operations:

Type	Variable	Comment
Analog	Second, Minutes, …	6 Registers giving the time in **hour**, **minute**, **second**, **day**, **month** and **year**.
Analog	UtcTime	Time in UTC format (number of seconds since 1/1/1970 at Greenwich latitude)
Analog	ZonBia	Time difference in seconds between the local time and time UTC
Analog	ZonId	ID of the zone where the RTU is installed. It uses regional settings of the PC

B.4. Summary

Summary of time handling in the different cases:

1. System variables in the RTU	They display the local time where the RTU is installed, according to the Regional settings declared in the 'General' RTU properties
2. Identification from TWinSoft	The UTC time is computed according to Regional settings of the PC
3. List of alarms in a report	The time is calculated according to RTU local time (see 1. above)
4. List of alarms in TWinSoft	See point 2. above
5. Object 'Time' in WebForm	See point 2. above
6. System variables in WebForm	Displays the value of the variables, as explained point 1. above

Appendix C. Plug & Go

Plug & Go allows storing the complete TWinSoft project into the MMC of ***TBox MS***

MMC stands for **Multi Media Card**. It is also known as a **SD card**. It is a **memory card** (up to 1 Gbytes) that can be inserted in the dedicated MS-CPUxx socket, at the back of the card (see manual ***"TBox-MS Technical Specifications"***).

As TWinSoft project, we mean **all files**, including TWinSoft compiled document with Web and Report files, OS and even Loader; all ready to run in the RTU.

When inserting a memory card on existing MS-CPU16, you will have to remove the card from the rack.
If the jumper to use the lithium battery has not been closed, the CPU will restart at 1-1-1970 !
You have then to do send the program again.

See info in manual *"TBox-MS Technical Specifications"* → chapter MS-CPUxx

There are 4 ways *Plug & Go* can be used: **(with MS-CPU16, OS 3.04.381 minimum is required)**

1. **TWinSoft send the project directly to the MMC.**

   When TWinSoft sends a program to the RTU, **all the files are sent and stored in the MMC**. This corresponds to a complete backup of the project on the MMC.
   The advantage is that if you have **to replace a CPU**, you don't need to send the program; you insert the MMC in the new CPU and it will start with its program.

2. **You insert an empty MMC in a CPU.**

   If an empty MMC is inserted into a CPU, the project is automatically stored in the MMC.
   It can be useful to retrieve a complete project, to copy to another CPU.

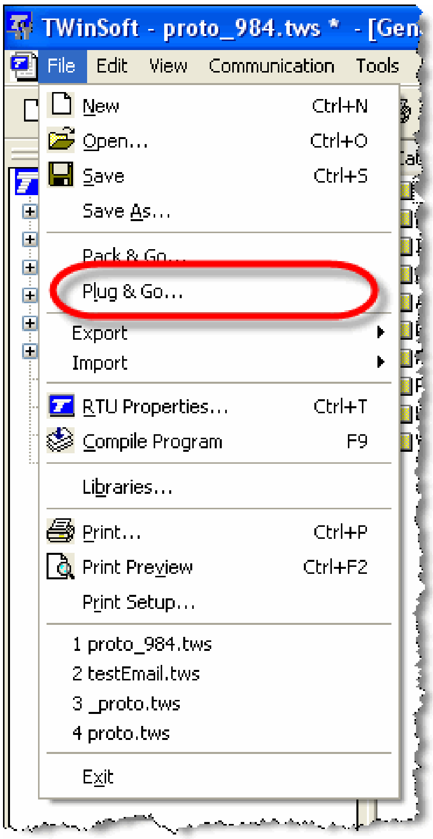
3. **You insert an MMC with a program in a CPU.**

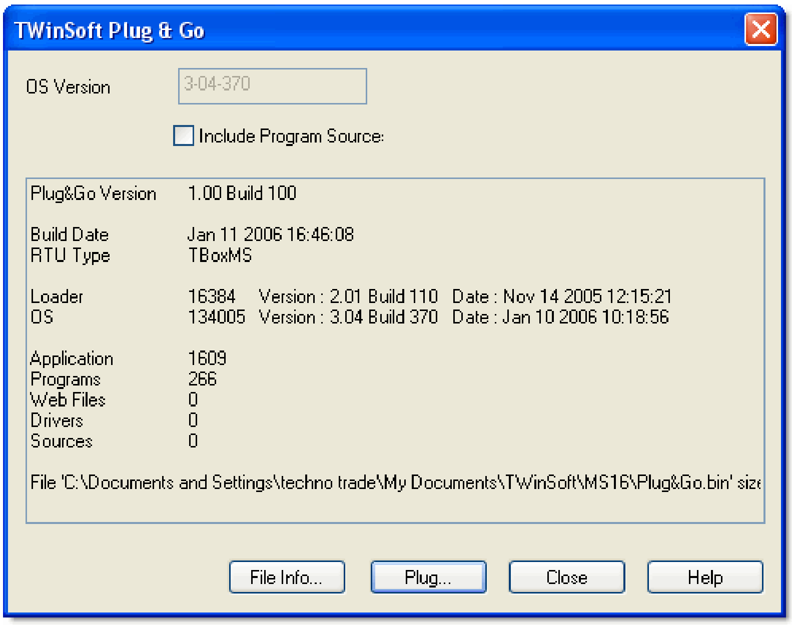
   In case of differences between MMC and CPU programs, **MMC has always priority**.
   Both programs are compared (dates are compared). When dates of creation of the program are different, the program (including OS) is copied from the MMC to the CPU.

4. You program the MMC directly from TWinSoft.

A menu in TWinSoft allows storing the project to the MMC.
With *Plug & Go* menu, TWinSoft compiles the complete project into a file called **Plug&Go.bin**. You then copy this file to the MMC, using a Card Reader on your PC.
The advantage is that you don't need TWinSoft to program the RTU. You can distribute the MMC to the people installing the RTU.

Menu of TWinSoft:





OS Version 3-04-370

☐ Include Program Source:

Plug&Go Version 1.00 Build 100

Build Date Jan 11 2006 16:46:08
RTU Type TBoxMS

Loader 16384 Version : 2.01 Build 110 Date : Nov 14 2005 12:15:21
OS 134005 Version : 3.04 Build 370 Date : Jan 10 2006 10:18:56

Application 1609
Programs 266
Web Files 0
Drivers 0
Sources 0

File 'C:\Documents and Settings\techno trade\My Documents\TWinSoft\MS16\Plug&Go.bin' size

This option is only available for ***TBox MS*** or ***TBox LITE***.
It is grayed with other models of RTU.

Plug…: Click this button to compress the Project to the Plug&Go.bin file.
The name is unique. It means if you want to create Plug & Go files for several RTU's, you have to save each file in a separate directory.

Once the Project is compressed, the window displays File Info (see example above)

File Info…: Click this button and select a Plug&Go.bin file to display its Info

System variable

A digital system variable is available when using MMC:

29	MmcToRTU	-	MMC: indicates whether the program has been loaded from the MMC **1** = the program of the MMC is different from the one of the RTU and has been loaded from the MMC **0** = there is no MMC; the MMC is empty; the program of the MMC is identical to the one of the RTU

File 'System.xml'

With ***TBox MS16*** This file can be used to initialize IP settings of the RTU (see the manual ***Technical Specifications***)

When there are Plug&Go.bin and system.xml files, the latter has priority.

LEDs on *TBox MS16*

LEDs of the CPU 16bits indicate the transfer of data from the MMC to the RTU.

Information available at start-up of the CPU:

LED 'Er' = ON during 1 second	Program transferred from the MMC to the RTU
LED 'Al' = flashes once	System.xml settings only transferred to the RTU.

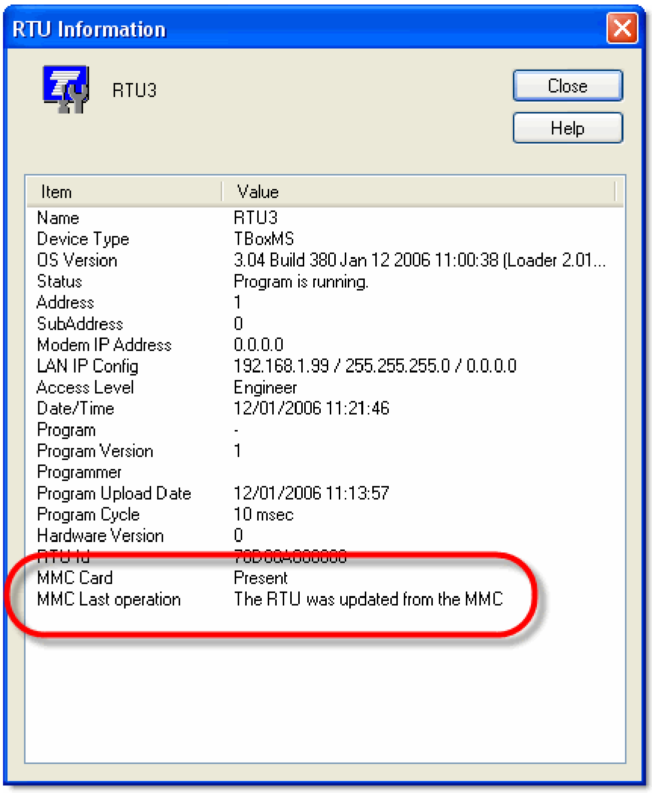
LEDs on *TBox MS32*

Information available at start-up of the CPU:

LED 'RUN'	Flashing during transfer from RTU to MMC
LED 'Er'	ON during transfer from the MMC to the RTU.

RTU identification

Data relative to MMC is available in RTU identification window:



Item	Value
Name	RTU3
Device Type	TBoxMS
OS Version	3.04 Build 380 Jan 12 2006 11:00:38 (Loader 2.01...
Status	Program is running.
Address	1
SubAddress	0
Modem IP Address	0.0.0.0
LAN IP Config	192.168.1.99 / 255.255.255.0 / 0.0.0.0
Access Level	Engineer
Date/Time	12/01/2006 11:21:46
Program	-
Program Version	1
Programmer	
Program Upload Date	12/01/2006 11:13:57
Program Cycle	10 msec
Hardware Version	0
RTU Id	70D00A000000
MMC Card	Present
MMC Last operation	The RTU was updated from the MMC

Appendix D. Pack & Go

D.1. Presentation

Pack & Go is a tool that builds up one file with your complete project, including TWinSoft document, WebForms, Reports, OS, loader...

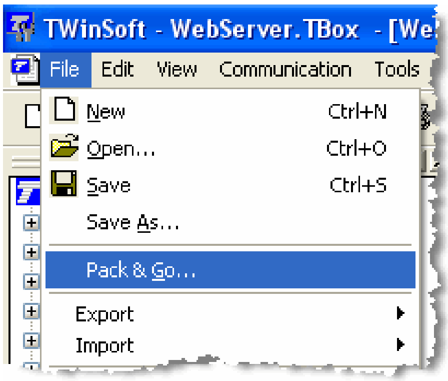
The goal is to **backup** or to **transfe**r a complete project without missing files or to update an RTU with the complete project without requiring advanced knowledge of TWinSoft.

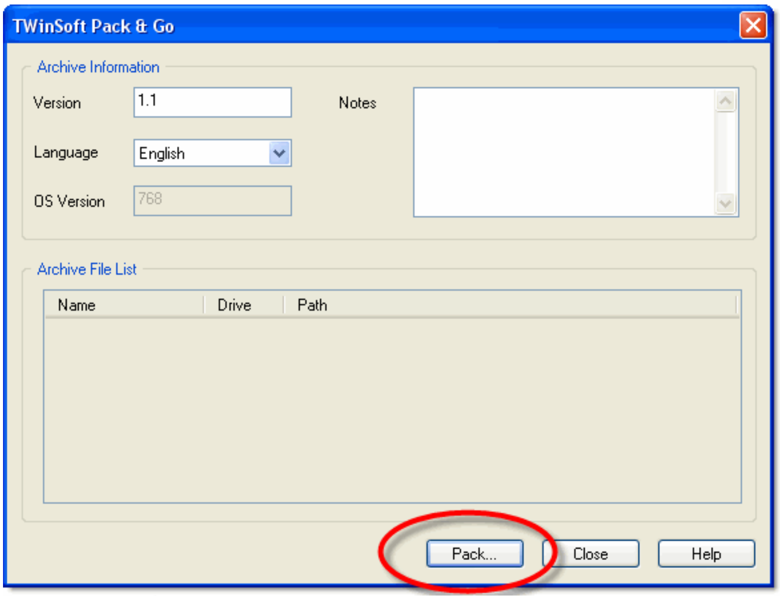
All files are compressed and packed into one file with the extension **.tpg** (TWinSoft Pack & Go).
Once a project is packed, it can be unpacked and/or updated to the RTU with a double click on the **.tpg** file.

TWinSoft **needs to be installed** on the machine used to update the RTU with .tpg file, but the **TWinSoft license is not required**.

D.2. Pack

To access Pack & Go menu, select from the main menu 'File' → 'Pack & Go…'




TWinSoft Pack & Go

Archive Information

Version: 1.1

Language: English

OS Version: 768

Notes

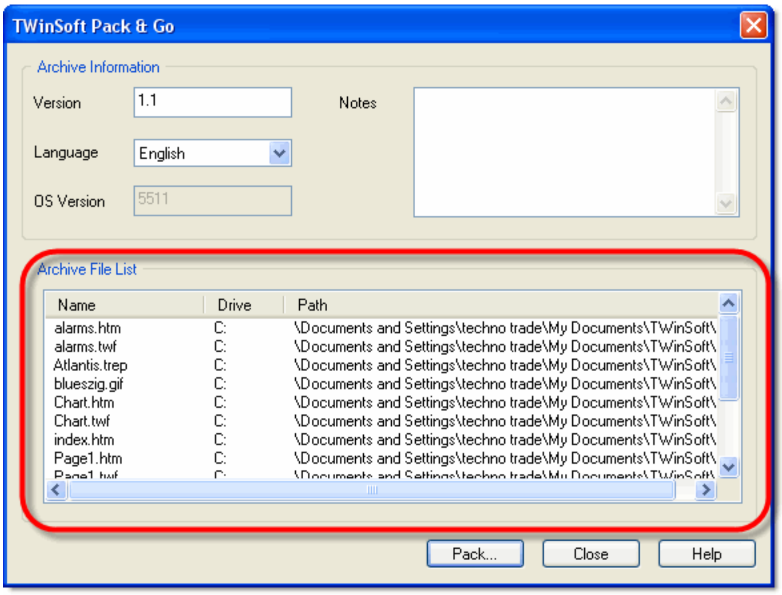
Archive File List

Name	Drive	Path

Select the button **Pack ...**

IF YOU ARE OFF LINE while compiling, TWinSoft uses the OS indicated as 'Off line OS' in the 'General RTU properties'. This OS, and only this OS, will be sent to the RTU.

All Files of the project, TwinSoft document, WebForm, html pages, OS, … are packed in one file, with the extension **.tpg**



TWinSoft Pack & Go

Archive Information

Version: 1.1

Language: English

OS Version: 5511

Notes

Archive File List

Name	Drive	Path
alarms.htm	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
alarms.twf	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
Atlantis.trep	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
blueszig.gif	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
Chart.htm	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
Chart.twf	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
index.htm	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
Page1.htm	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\
Page1.twf	C:	\Documents and Settings\techno trade\My Documents\TWinSoft\

Be sure the user running the .tpg file runs a version of TWinSoft equal or higher than the one used to pack the files.

D.3. Unpack

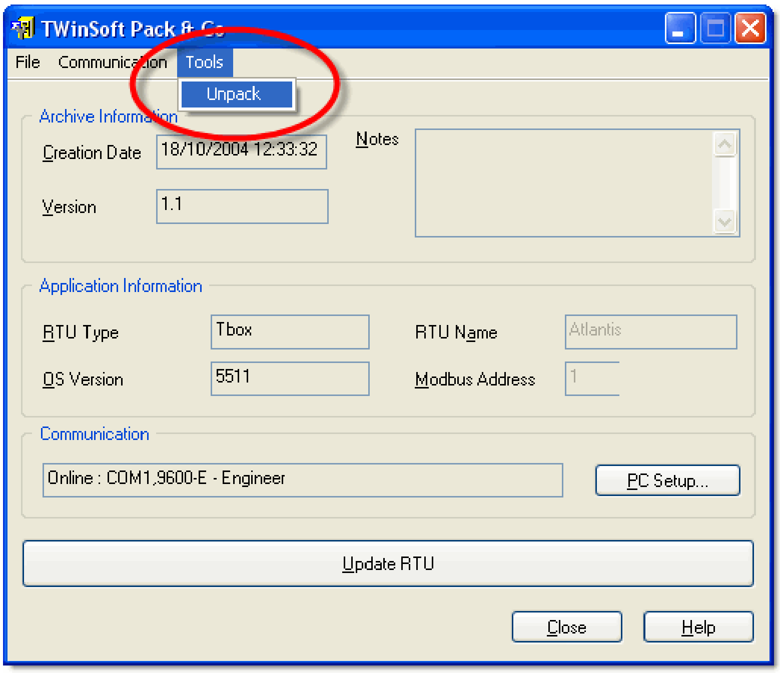
To open the Unpack window, double click a file with the extension **.tpg**.

Unpack menu offers 2 features:

1. Restore a project

Extract a project into a directory of your PC. This option is very convenient for backing up a project being sure you don't miss any file.

Option available from the main menu: 'Tools' → Unpack.



TWinSoft Pack & Go

Archive Information

Creation Date: 18/10/2004 12:33:32

Version: 1.1

Notes

Application Information

RTU Type: Tbox

RTU Name: Atlantis

OS Version: 5511

Modbus Address: 1

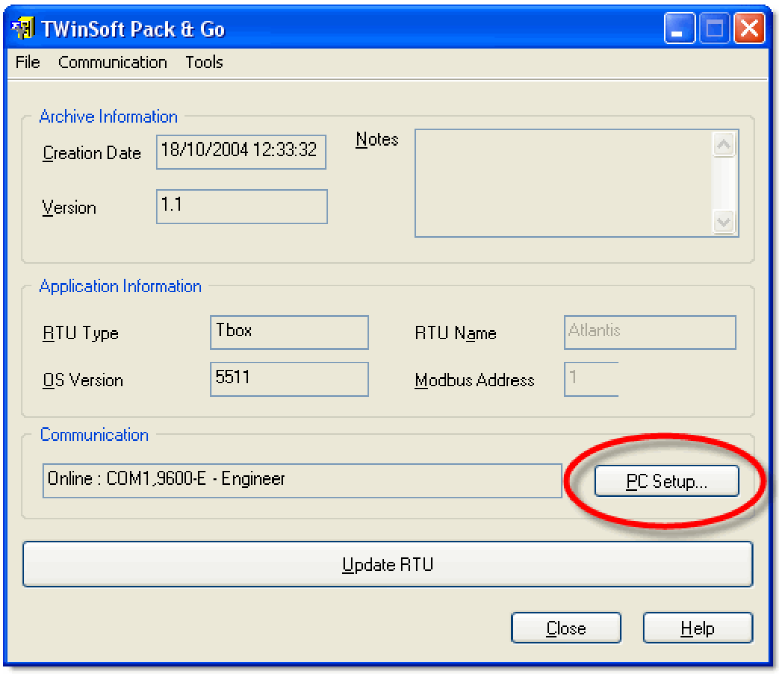
Communication

Online : COM1,9600-E - Engineer

2. Update an RTU

Update an RTU with a complete project, including the application, OS, WebForms, report, ...from a unique file.

The button 'PC Setup…' gives you access to the configuration of the PC, to communicate with the RTU.



Archive Information

Creation Date: 18/10/2004 12:33:32

Version: 1.1

Notes

Application Information

RTU Type: Tbox

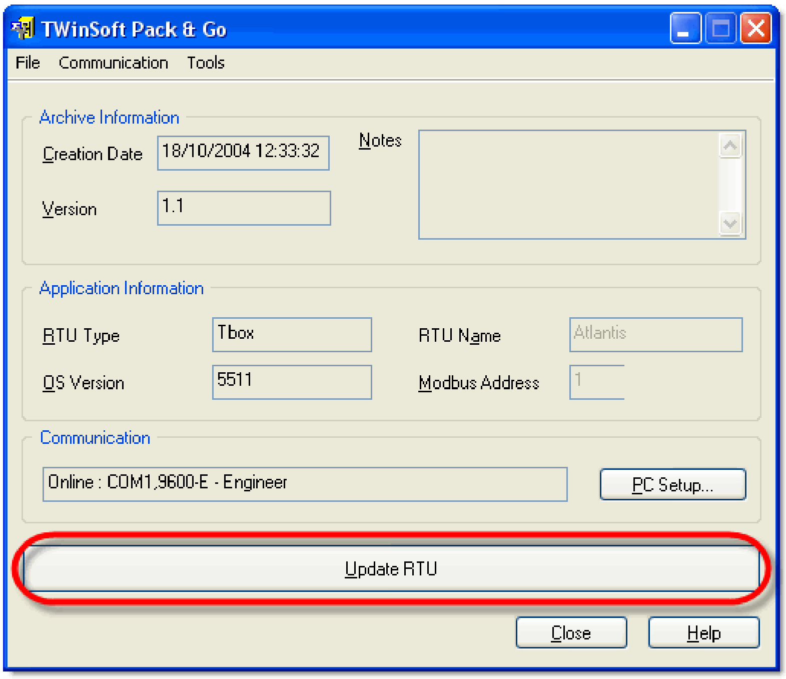
RTU Name: Atlantis

OS Version: 5511

Modbus Address: 1

Communication

Online : COM1,9600-E - Engineer



Archive Information

Creation Date: 18/10/2004 12:33:32

Version: 1.1

Notes

Application Information

RTU Type: Tbox

RTU Name: Atlantis

OS Version: 5511

Modbus Address: 1

Communication

Online : COM1,9600-E - Engineer

The button 'Update RTU' sends the project and OS to the RTU.

If packed OS is different from OS in the RTU, Pack & Go updates the RTU with the OS.

WARNING with OS 54xx in CPU3 and 55xx in Pack & Go. For CPU with S/N > 200508xxxx, OS 5499 must first be uploaded before uploading to OS 55xx.

Languages supported are English, French and German.
It cannot be selected from 'Unpack' menu but changed from TWinSoft main menu: 'Tools' → 'Language'

Appendix E. ModBus Rerouting

E.1. Presentation

One of the nice communication features offered by ***TBox MS*** is the ability to act as a **ModBus router**. That means that you can use a ***TBox MS*** to make a connection between 2 ModBus devices that are not on the same communication channel.

The routing mechanism analyzes only the "Station address" in the request. In case a request is not addressed to ***TBox MS***, it will be forwarded it to the other port
It can then be used with ***TBox MS*** connected to any ModBus device.

ModBus Protocols
This features routes ports configured in ModBus protocol(s):
- ModBus-RTU <--> ModBus-RTU
- ModBus-RTU <--> ModBus/TCP

Routing 2 ports in ModBus/TCP, is called **IP forwarding** (see next chapter).

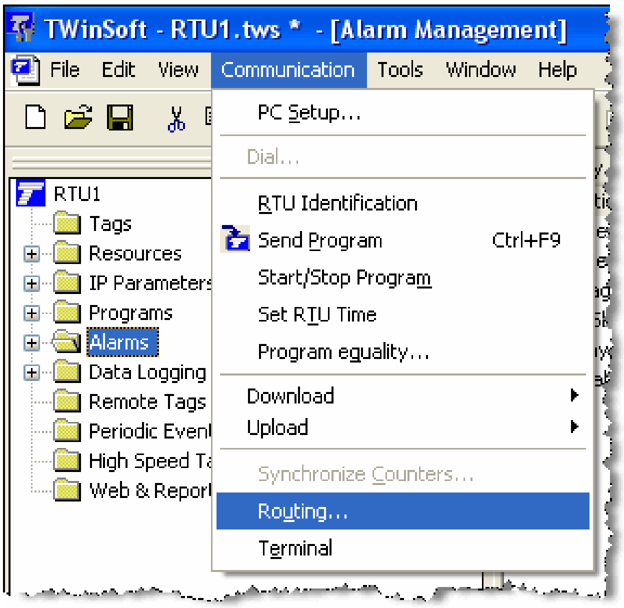
Communication principle
The idea is that the TBox MS receiving frames, analyzes the Station address: if it is for its own use, it keeps the frames, otherwise the frames are pushed to the 'routed' com. port.

E.2. Routing using TWinSoft

ModBus rerouting allows associating two 'ModBus-RTU' communication ports, in order to access a remote RTU **with TWinSoft** from your computer by rerouting through a 'Master' RTU.

The typical application, is dialing an RTU to access a remote RTU connected to the RS485 network.

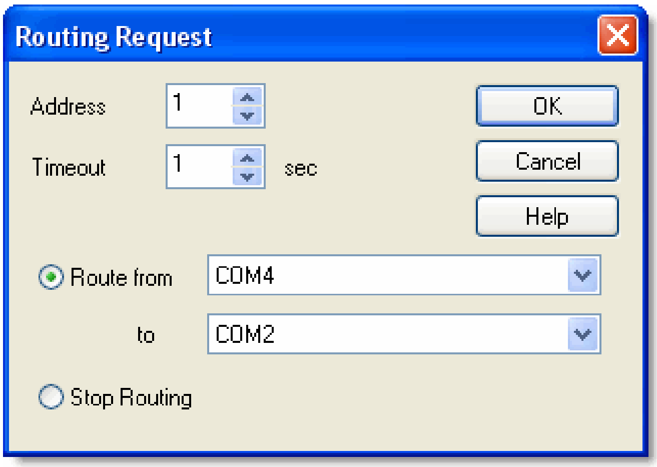
You access routing from the main menu of TWinSoft : Communication → Routing



Address : Address of the RTU you are physically connected (the 'Master')

Timeout : Rx timeout used to communicate with the Remote device

Route from : incoming communication port (the port of the 'Master' TWinSoft is connected to)
to : outgoing communication port (the port of the 'Master' connected to the remote device)


Routing Request

Address 1

Timeout 1 sec

● Route from COM4

to COM2

○ Stop Routing

Sequence to access a Remote RTU in rerouting:

- Open in TWinSoft the document corresponding to the 'Master' RTU
- Fill in the Routing request menu as explained above.
- Open in TWinSoft the document corresponding to the 'Remote' RTU (if you were using modem communication, you will have to redial the "Master").

You are in communication with the Remote ***TBox MS***.

This sequence is only possible when Master and Remote are the **same model of RTU**. If not, you have to pre-configure the Analog system variable (see next)

Analog System variable 'Rerout'

An **analog system variable 'Rerout'** can also be used in your Ladder/BASIC logic to force a rerouting. This 16 bits variable represents 16 communication ports, with the **lsb** corresponding to COM1.
Example: A rerouting between COM4(…001000) and COM2 (…000010) corresponds to the decimal value =10 (…001010)

Rerouting is only possible with local communication ports configured in ModBus

Sending a program using Rerouting

For instance, you can send a program by dialing a "Master", and accessing "Slaves" on RS485 network.

Doing a 'local' rerouting, for instance from a RS232 port to a RS485, we recommend using the same Baudrate **all ports**.
If you have 'Remote Tags' running between 'Master' and 'Slave', we recommend stopping them during rerouting, to avoid communication errors.

E.3. Possibilities of Routing

The table below shows all possible connections between 2 ports:

IN: port in which requests are coming
OUT: ports to which requests have to be sent if it does not concern the 'local' RTU (different ModBus address).

	OUT	**RS232**	**RS485**	**PSTN**	**GSM**	**GPRS**	**Ethernet**
IN		Routing	Routing	Routing (*)	Routing (*)	Not avail.	Not avail.
RS232		Routing	Routing	Routing (*)	Routing (*)	Not avail.	Not avail.
RS485		Routing	Routing	Routing (*)	Routing (*)	Not avail.	Not avail.
PSTN		Routing	Routing	Routing (*)	Routing (*)	Not avail.	Not avail.
GSM		Routing	Routing	Routing (*)	Routing (*)	Not avail.	Not avail.
GPRS		Routing	Routing	Routing (*)	Routing (*)	IP Forward	IP Forward
Ethernet		Routing	Routing	Routing (*)	Routing (*)	IP Forward	IP Forward

(*) : increase Time out (see above) to at least 2 seconds, and with GPRS at least 10 seconds.

Appendix F. IP forwarding

IP forwarding feature allows **forwarding IP requests** from one communication port to any communication ports configured in IP:

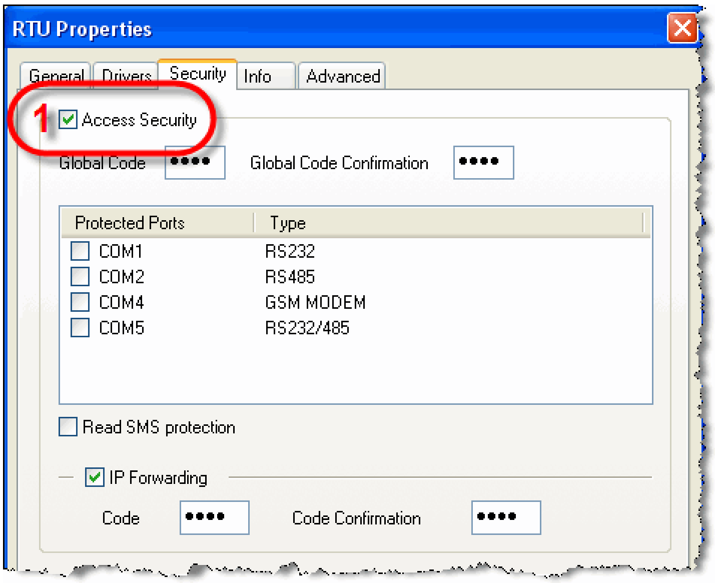
- IP modem connection (for instance incoming connection from **TBox Dial it!**)
- Ethernet ports

The typical use is a remote access to an **IP camera** connected to the Ethernet port of the RTU: you dial the RTU with **TBox Dial it!** and display a HTML page containing a link to the IP address of the camera.

IP forwarding requires **enhanced security**. As a matter of fact, if an Ethernet port of the RTU is connected to a LAN, and the IP forwarding is activated, anyone can access the LAN from a modem connection!

We provide several security levels, to enable IP forwarding:

1. From the 'Security' tab, the general access security of the document must be activated with a first password.



RTU Properties

☑ Access Security

Global Code •••• Global Code Confirmation ••••

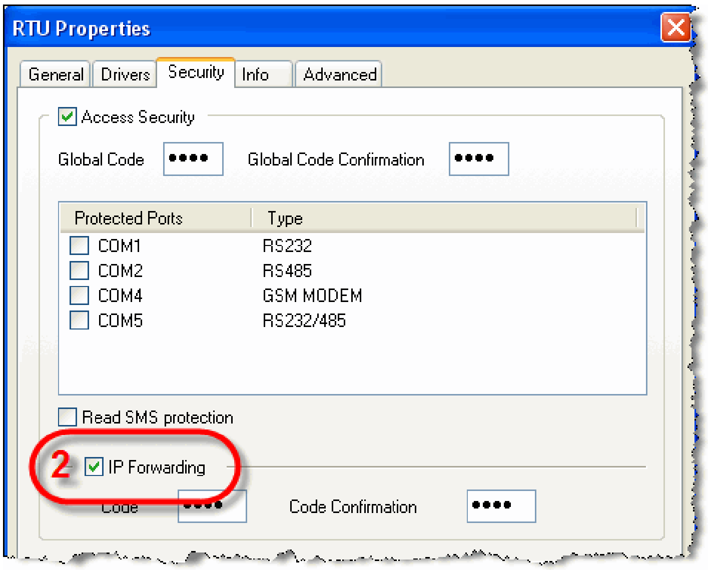
Protected Ports	Type
☐ COM1	RS232
☐ COM2	RS485
☐ COM4	GSM MODEM
☐ COM5	RS232/485

☐ Read SMS protection

☑ IP Forwarding

Code •••• Code Confirmation ••••

2. From the 'Security' tab, IP forwarding must be activated. You have to type a second 4 digit hexadecimal code.
   This hexadecimal code is used as global code to generate the IP forwarding login (see 3.)
   Password generator is used to generate the login:
   Start → Programs → Techno Trade → Accessories → Password generator



RTU Properties

☑ Access Security

Global Code •••• Global Code Confirmation ••••

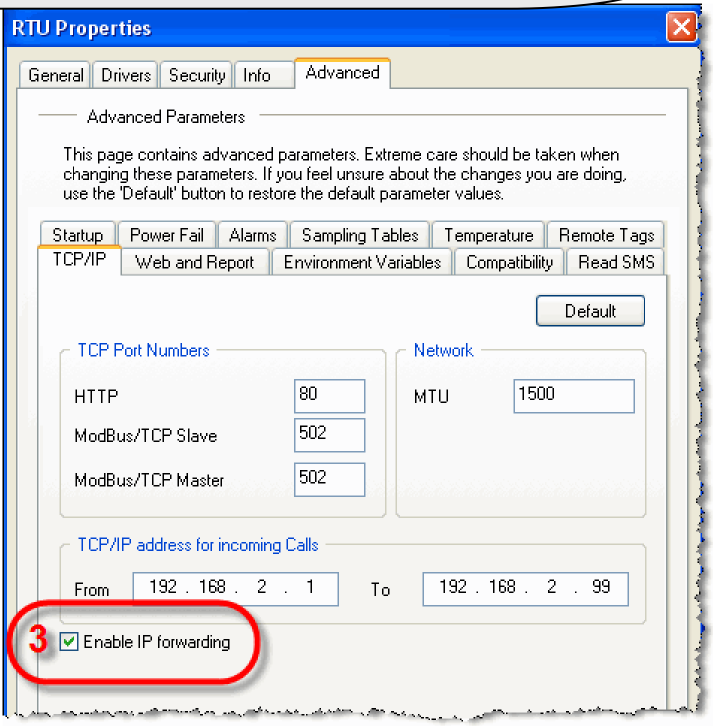
Protected Ports	Type
☐ COM1	RS232
☐ COM2	RS485
☐ COM4	GSM MODEM
☐ COM5	RS232/485

☐ Read SMS protection

☑ IP Forwarding

Code •••• Code Confirmation ••••

To improve protection, we advise not to use the same codes in those two configurations.



RTU Properties

Advanced Parameters

This page contains advanced parameters. Extreme care should be taken when changing these parameters. If you feel unsure about the changes you are doing, use the 'Default' button to restore the default parameter values.

TCP Port Numbers

HTTP 80

ModBus/TCP Slave 502

ModBus/TCP Master 502

Network

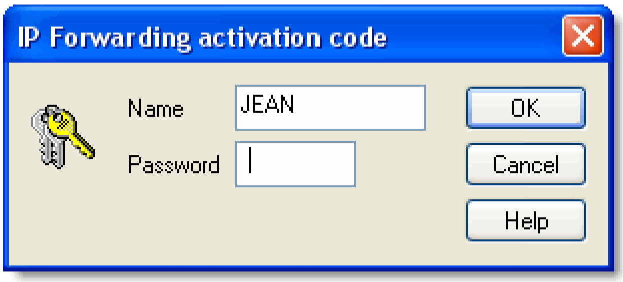
MTU 1500

TCP/IP address for incoming Calls

From 192 . 168 . 2 . 1 To 192 . 168 . 2 . 99

☑ Enable IP forwarding

3. From the Advanced properties, 'TCP/IP' tab, you have to enable IP forwarding



IP Forwarding activation code

Name JEAN

Password |

Clicking 'OK', you are prompted to type a NAME and PASSWORD as **IP forwarding activation code**.
This login must be created from the code entered in step 2. above

To deactivate IP forwarding, you are also prompted to type the IP forwarding activation code.
To improve security, **NAT rules** can be configured (see RTU advanced properties).

Appendix G. Debugging tools

G.1. Modem debugging with MS-CPU16

The debug mode allows displaying all data flowing through a modem.
This is very useful when encountering problems in modem communication.

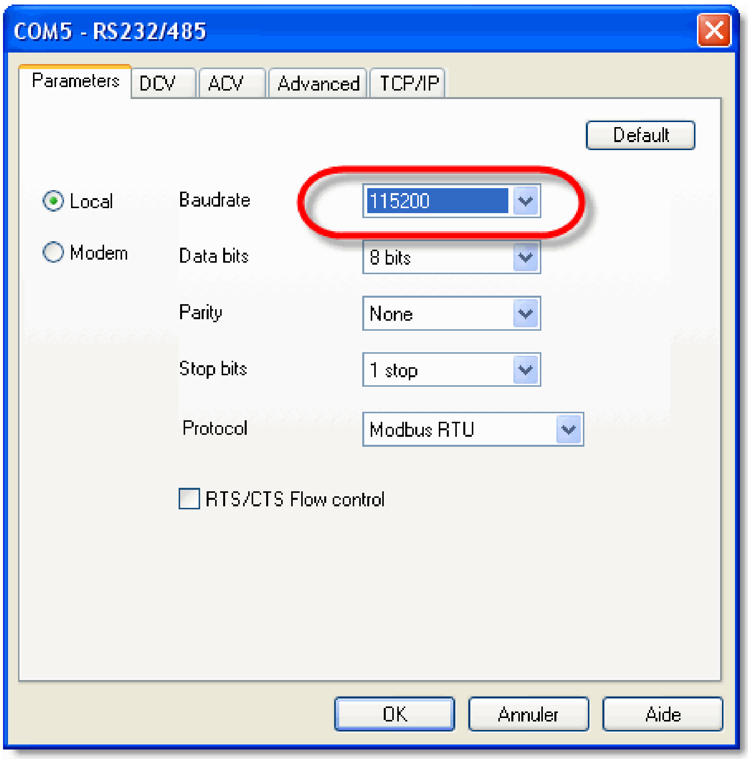
The 'Debug mode' is set to the RS232 port associated to the modem. For example if you have a GSM on **COM4** that you wish to spy, Debug mode will be set to **COM5**.

Sequence to set a modem in Debug mode:

1.

Change **first** the Baudrate of the RS232 port associated to the modem to 115200 Bps (COM5 in this example)

Leave the protocol setting to 'ModBus RTU'


COM5 - RS232/485

● Local
○ Modem

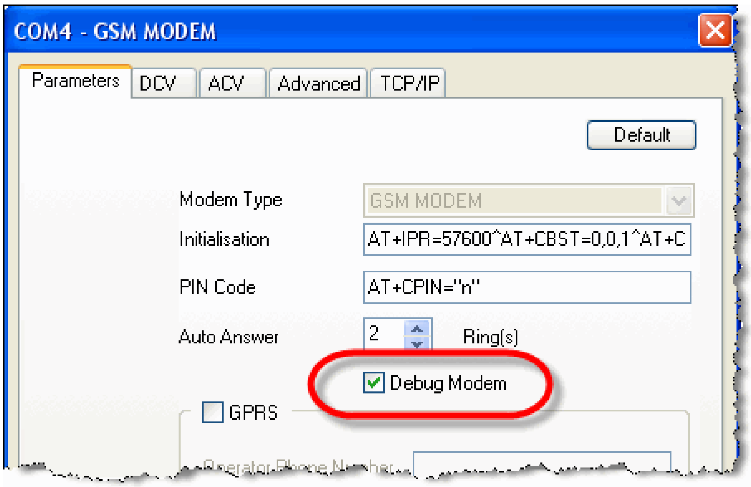
Baudrate: 115200
Data bits: 8 bits
Parity: None
Stop bits: 1 stop
Protocol: Modbus RTU

□ RTS/CTS Flow control

Example to debug a GSM on COM4

2.

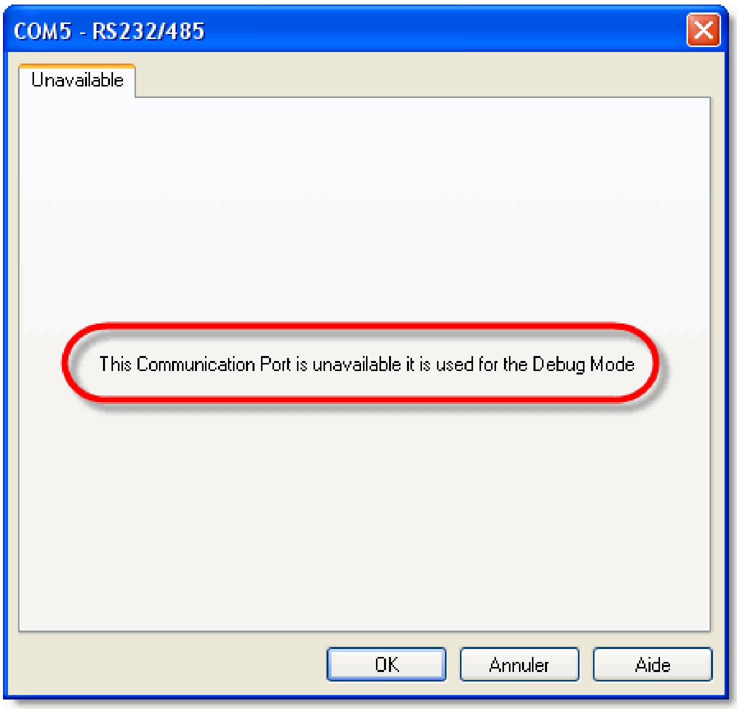
In the Modem parameters, check the option '**Debug Modem**' (COM5 in this example)


COM4 - GSM MODEM

Modem Type: GSM MODEM
Initialisation: AT+IPR=57600^AT+CBST=0,0,1^AT+C
PIN Code: AT+CPIN="n"
Auto Answer: 2 Ring(s)
☑ Debug Modem
□ GPRS
Operator Phone Number

Example to debug a GSM on COM4

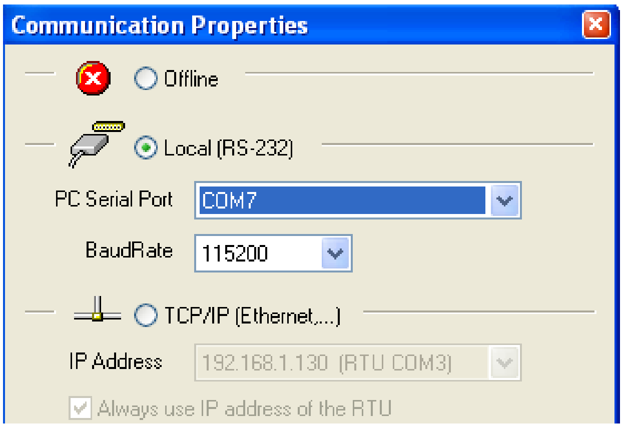
It is very important **you change first the Baudrate** of the RS232 port **BEFORE** activating Debug mode. When the latter has been set, the RS232 port is not available anymore, as you can see…



This Communication Port is unavailable it is used for the Debug Mode

3. **Send the program** to the RTU

4. In the menu "Communication" → "PC Setup", select the serial port of the PC you use to connect to the RS232 port of debug. Set baudrate to 115200 Bps.



○ Offline

● Local (RS-232)

PC Serial Port: COM7

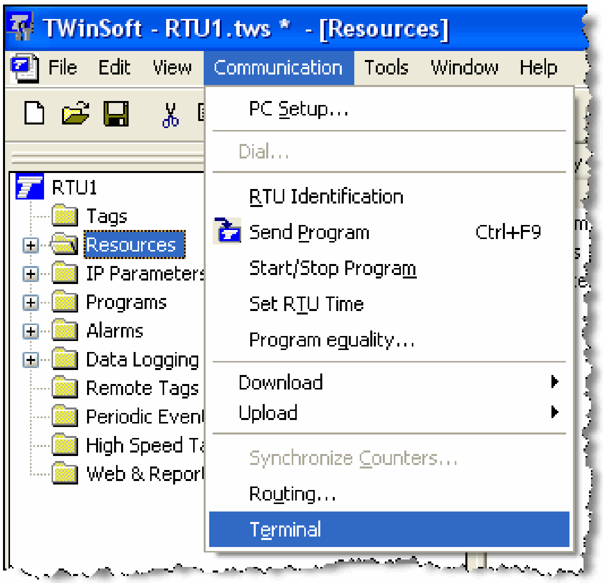
BaudRate: 115200

○ TCP/IP (Ethernet,...)

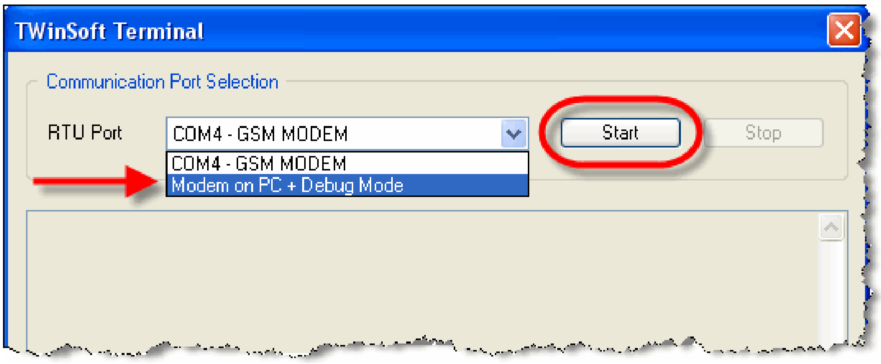
IP Address: 192.168.1.130 (RTU COM3)

☑ Always use IP address of the RTU

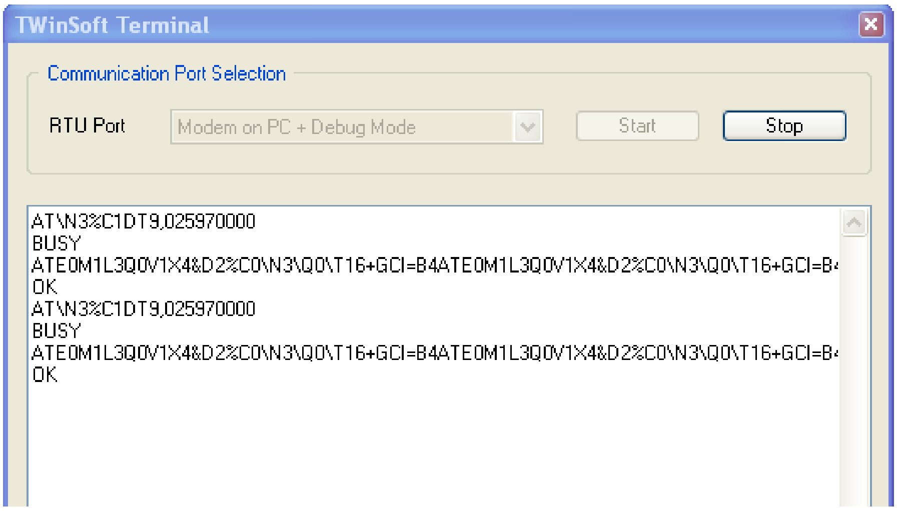
5. Open the TWinSoft 'Terminal' window in 'Debug mode'…



… click 'Start'



… after few tests you get:



```
AT\N3%C1DT9,025970000
BUSY
ATE0M1L3Q0V1X4&D2%C0\N3\Q0\T16+GCI=B4ATE0M1L3Q0V1X4&D2%C0\N3\Q0\T16+GCI=B4
OK
AT\N3%C1DT9,025970000
BUSY
ATE0M1L3Q0V1X4&D2%C0\N3\Q0\T16+GCI=B4ATE0M1L3Q0V1X4&D2%C0\N3\Q0\T16+GCI=B4
OK
```

All data flowing through the modem will appear in the window.

To receive some interesting information with this mode, you should force some communication from your RTU through the modem, like a reset of the RTU, triggering an alarm, …

G.2. TCP/IP debugging with MS-CPU16

This feature is very convenient to trace problems when doing TCP/IP connections (e-mails, POP3, FTP).

It informs on the different steps of the connection: Login to the ISP, obtain of DNS, Smtp communication, …

It is based on 3 'System variables': TcpIpLog, PortIdLog and EventLog

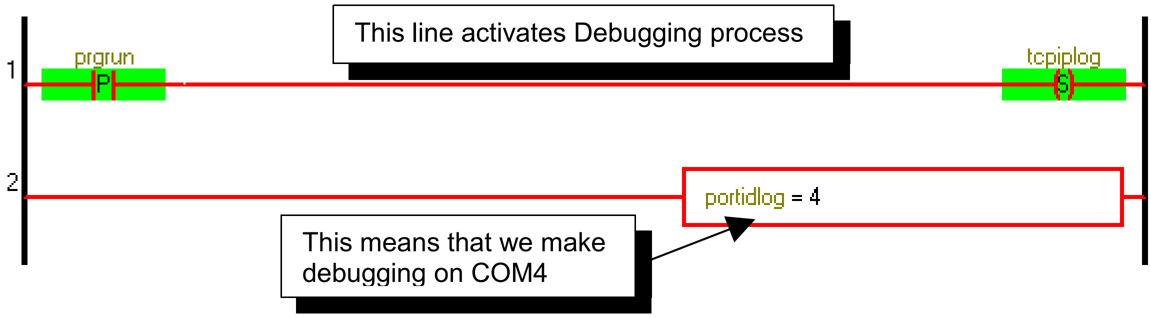
Procedure

1. One System variable must be Tagged: **Analog # 25: EventLog**

   Keep the ModBus address as it is (22080). Do not change it.

   It is not necessary to Tag the 2 other variables.

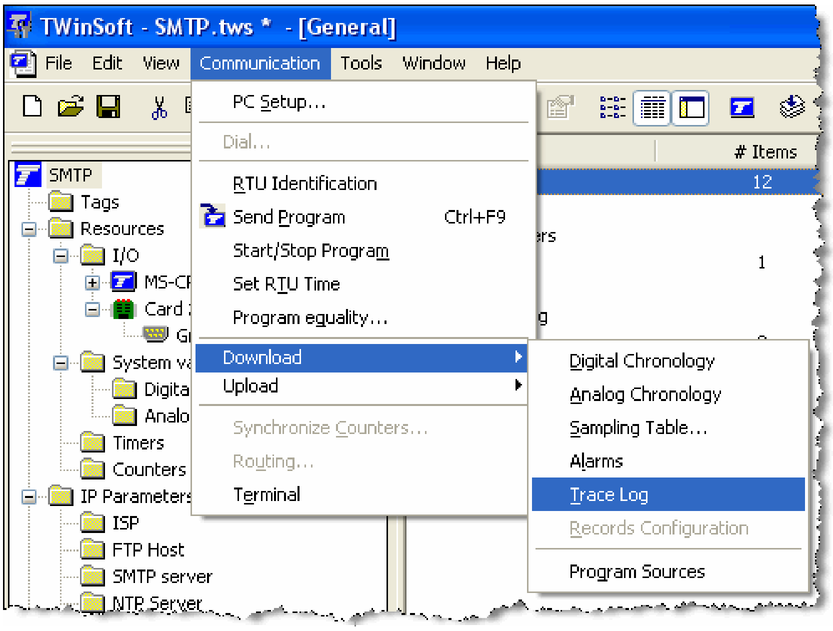
2. Make the following lines of Ladder:


1
prgrun
P
This line activates Debugging process
tcpiplog
S
2
portidlog = 4
This means that we make debugging on COM4

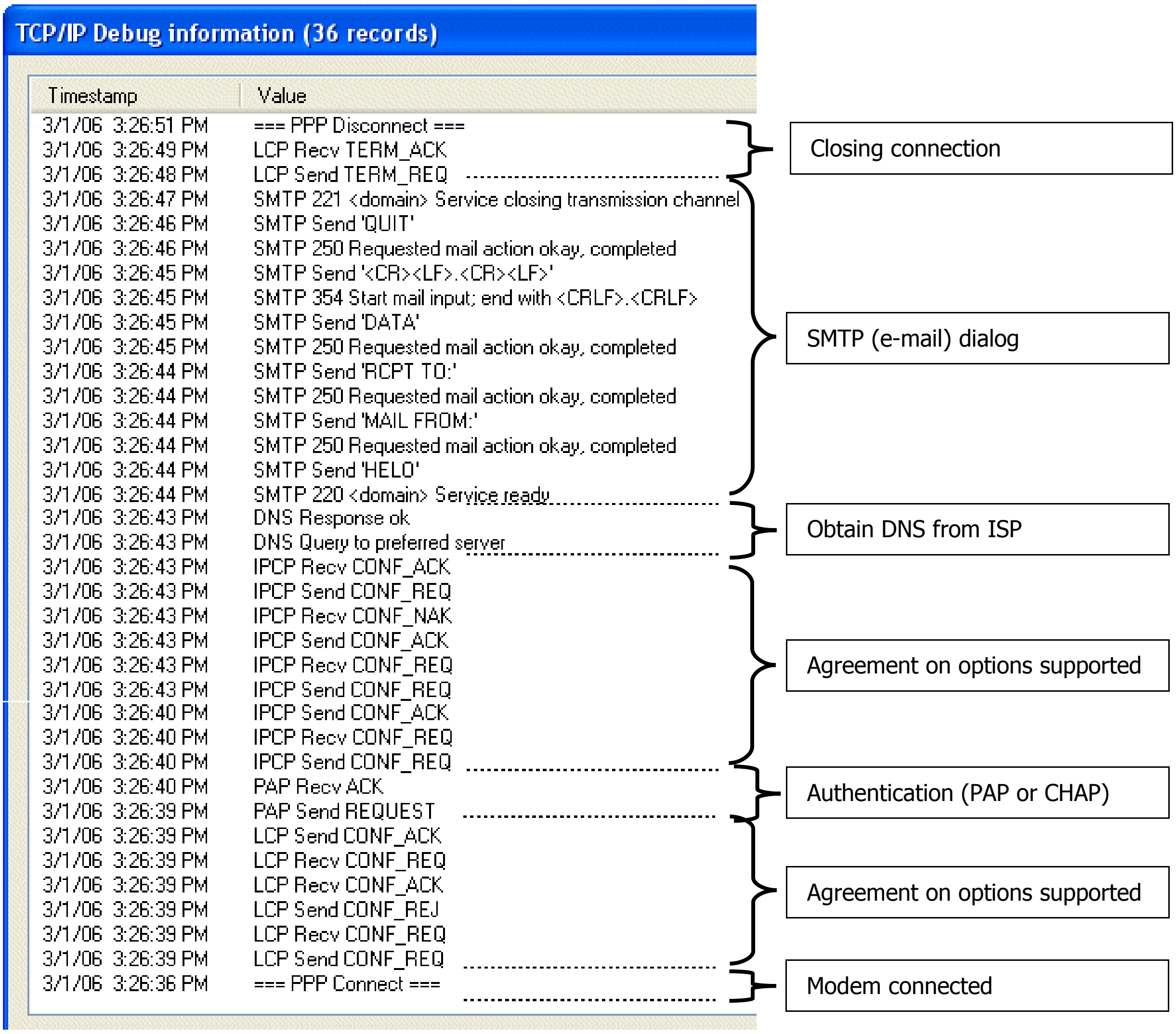
Example on debugging through MS-PSTN modem (COM4)

As you can see, we use the system variables without having Tagged them (brown color). You can also Tag them if you want.

3. Once the connection is finished, look at the trace from the 'Communication menu'



4. Example of TraceLog when sending e-mail works fine:



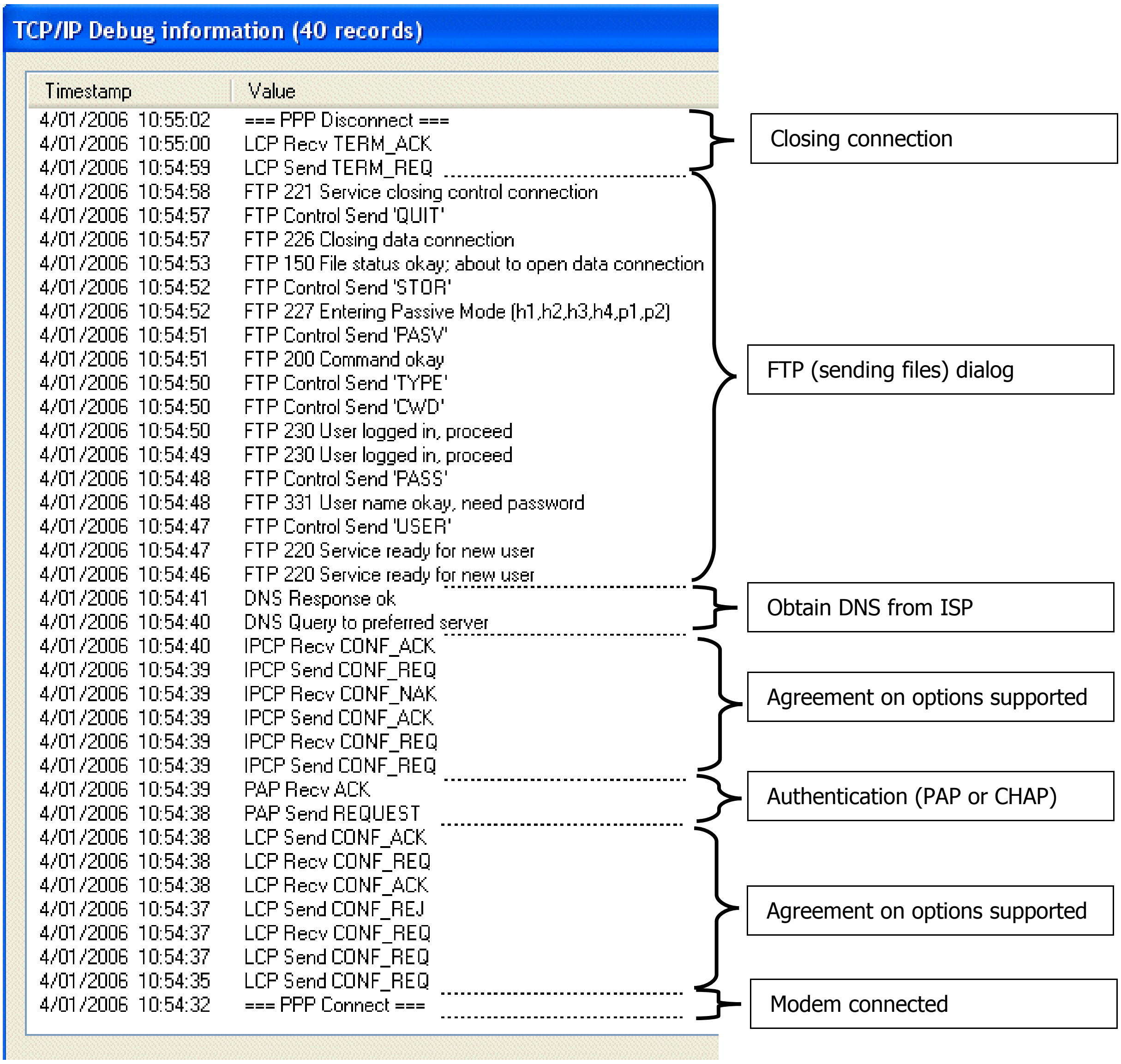
TCP/IP Debug information (36 records)

```
Timestamp           Value
3/1/06 3:26:51 PM   === PPP Disconnect ===
3/1/06 3:26:49 PM   LCP Recv TERM_ACK
3/1/06 3:26:48 PM   LCP Send TERM_REQ
3/1/06 3:26:47 PM   SMTP 221 <domain> Service closing transmission channel
3/1/06 3:26:46 PM   SMTP Send 'QUIT'
3/1/06 3:26:46 PM   SMTP 250 Requested mail action okay, completed
3/1/06 3:26:45 PM   SMTP Send '<CR><LF>.<CR><LF>'
3/1/06 3:26:45 PM   SMTP 354 Start mail input; end with <CRLF>.<CRLF>
3/1/06 3:26:45 PM   SMTP Send 'DATA'
3/1/06 3:26:45 PM   SMTP 250 Requested mail action okay, completed
3/1/06 3:26:44 PM   SMTP Send 'RCPT TO:'
3/1/06 3:26:44 PM   SMTP 250 Requested mail action okay, completed
3/1/06 3:26:44 PM   SMTP Send 'MAIL FROM:'
3/1/06 3:26:44 PM   SMTP 250 Requested mail action okay, completed
3/1/06 3:26:44 PM   SMTP Send 'HELO'
3/1/06 3:26:44 PM   SMTP 220 <domain> Service ready
3/1/06 3:26:43 PM   DNS Response ok
3/1/06 3:26:43 PM   DNS Query to preferred server
3/1/06 3:26:43 PM   IPCP Recv CONF_ACK
3/1/06 3:26:43 PM   IPCP Send CONF_REQ
3/1/06 3:26:43 PM   IPCP Recv CONF_NAK
3/1/06 3:26:43 PM   IPCP Send CONF_ACK
3/1/06 3:26:43 PM   IPCP Recv CONF_REQ
3/1/06 3:26:43 PM   IPCP Send CONF_REQ
3/1/06 3:26:40 PM   IPCP Send CONF_ACK
3/1/06 3:26:40 PM   IPCP Recv CONF_REQ
3/1/06 3:26:40 PM   IPCP Send CONF_REQ
3/1/06 3:26:40 PM   PAP Recv ACK
3/1/06 3:26:39 PM   PAP Send REQUEST
3/1/06 3:26:39 PM   LCP Send CONF_ACK
3/1/06 3:26:39 PM   LCP Recv CONF_REQ
3/1/06 3:26:39 PM   LCP Recv CONF_ACK
3/1/06 3:26:39 PM   LCP Send CONF_REJ
3/1/06 3:26:39 PM   LCP Recv CONF_REQ
3/1/06 3:26:39 PM   LCP Send CONF_REQ
3/1/06 3:26:36 PM   === PPP Connect ===
```

Closing connection
SMTP (e-mail) dialog
Obtain DNS from ISP
Agreement on options supported
Authentication (PAP or CHAP)
Agreement on options supported
Modem connected

TBox MS uses the 'Analog Chronologies' to store debugging data:
Check whether the size is sufficient (from the RTU properties → General)
If you retrieve data, for instance with Tview , you might receive strange data!

5. Example of TraceLog when sending Files (FTP) works fine:



TCP/IP Debug information (40 records)

```
Timestamp           Value
4/01/2006 10:55:02  === PPP Disconnect ===
4/01/2006 10:55:00  LCP Recv TERM_ACK
4/01/2006 10:54:59  LCP Send TERM_REQ
4/01/2006 10:54:58  FTP 221 Service closing control connection
4/01/2006 10:54:57  FTP Control Send 'QUIT'
4/01/2006 10:54:57  FTP 226 Closing data connection
4/01/2006 10:54:53  FTP 150 File status okay; about to open data connection
4/01/2006 10:54:52  FTP Control Send 'STOR'
4/01/2006 10:54:52  FTP 227 Entering Passive Mode (h1,h2,h3,h4,p1,p2)
4/01/2006 10:54:51  FTP Control Send 'PASV'
4/01/2006 10:54:51  FTP 200 Command okay
4/01/2006 10:54:50  FTP Control Send 'TYPE'
4/01/2006 10:54:50  FTP Control Send 'CWD'
4/01/2006 10:54:50  FTP 230 User logged in, proceed
4/01/2006 10:54:49  FTP 230 User logged in, proceed
4/01/2006 10:54:48  FTP Control Send 'PASS'
4/01/2006 10:54:48  FTP 331 User name okay, need password
4/01/2006 10:54:47  FTP Control Send 'USER'
4/01/2006 10:54:47  FTP 220 Service ready for new user
4/01/2006 10:54:46  FTP 220 Service ready for new user
4/01/2006 10:54:41  DNS Response ok
4/01/2006 10:54:40  DNS Query to preferred server
4/01/2006 10:54:40  IPCP Recv CONF_ACK
4/01/2006 10:54:39  IPCP Send CONF_REQ
4/01/2006 10:54:39  IPCP Recv CONF_NAK
4/01/2006 10:54:39  IPCP Send CONF_ACK
4/01/2006 10:54:39  IPCP Recv CONF_REQ
4/01/2006 10:54:39  IPCP Send CONF_REQ
4/01/2006 10:54:39  PAP Recv ACK
4/01/2006 10:54:38  PAP Send REQUEST
4/01/2006 10:54:38  LCP Send CONF_ACK
4/01/2006 10:54:38  LCP Recv CONF_REQ
4/01/2006 10:54:38  LCP Recv CONF_ACK
4/01/2006 10:54:37  LCP Send CONF_REJ
4/01/2006 10:54:37  LCP Recv CONF_REQ
4/01/2006 10:54:37  LCP Send CONF_REQ
4/01/2006 10:54:35  LCP Send CONF_REQ
4/01/2006 10:54:32  === PPP Connect ===
```

Closing connection

FTP (sending files) dialog

Obtain DNS from ISP

Agreement on options supported

Authentication (PAP or CHAP)

Agreement on options supported

Modem connected

Values

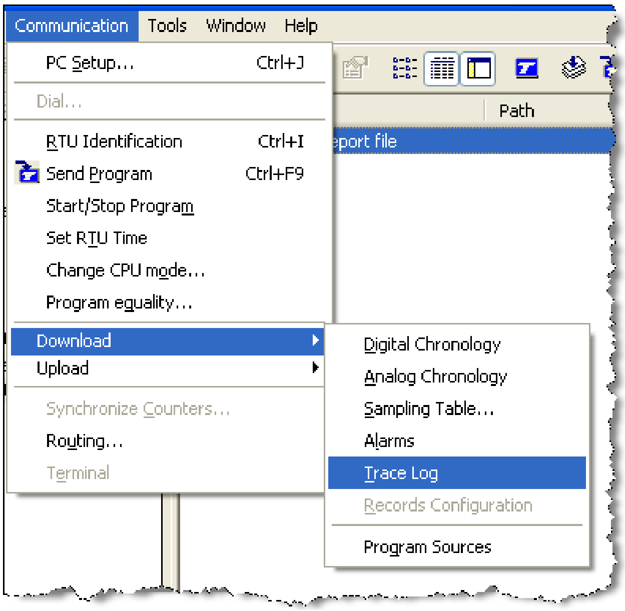
The column 'Value' returns messages from/to the Server.
When there is a code, it is always information received **from the Server**:

2xx: OK
3xx: OK, but something still missing
4xx: temporary error
5xx: permanent error. If ***TBox MS*** receives such a code, it stops communication and closes the socket.

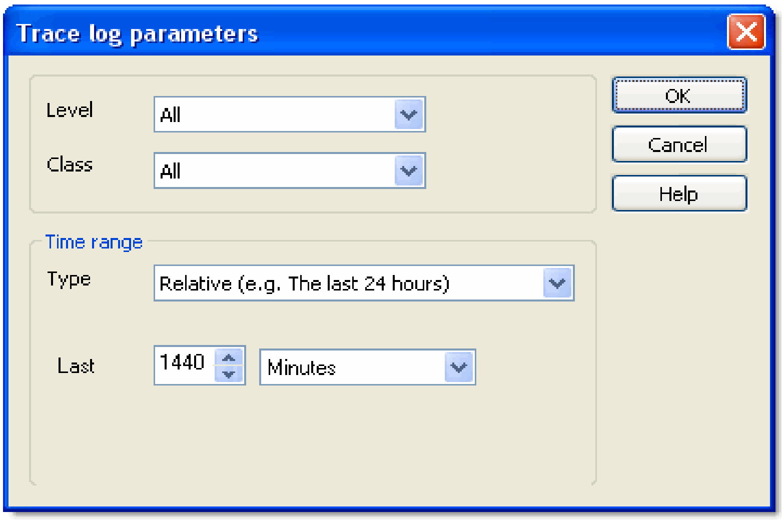
G.3. Debugging MS-CPU32

The **Trace Log** feature is a powerful tool to debug the ***TBox MS32***, like **modem connection** or **TCP/IP connection**.

When you are on line with your ***TBox MS32***, it can be accessed from the menu:
'Communication' ➔ 'Download' ➔ 'Trace Log':



Many events, related to many tasks are stored in the log.
To adjust the analyses, TWinSoft provides **2 filters**:


Trace log parameters

Level: All
Class: All

Time range
Type: Relative (e.g. The last 24 hours)
Last: 1440 Minutes

Level

The level allows you selecting the kind of messages (verbose, warning, info, ...).
You can also select 'All' to display all levels of messages.

Class

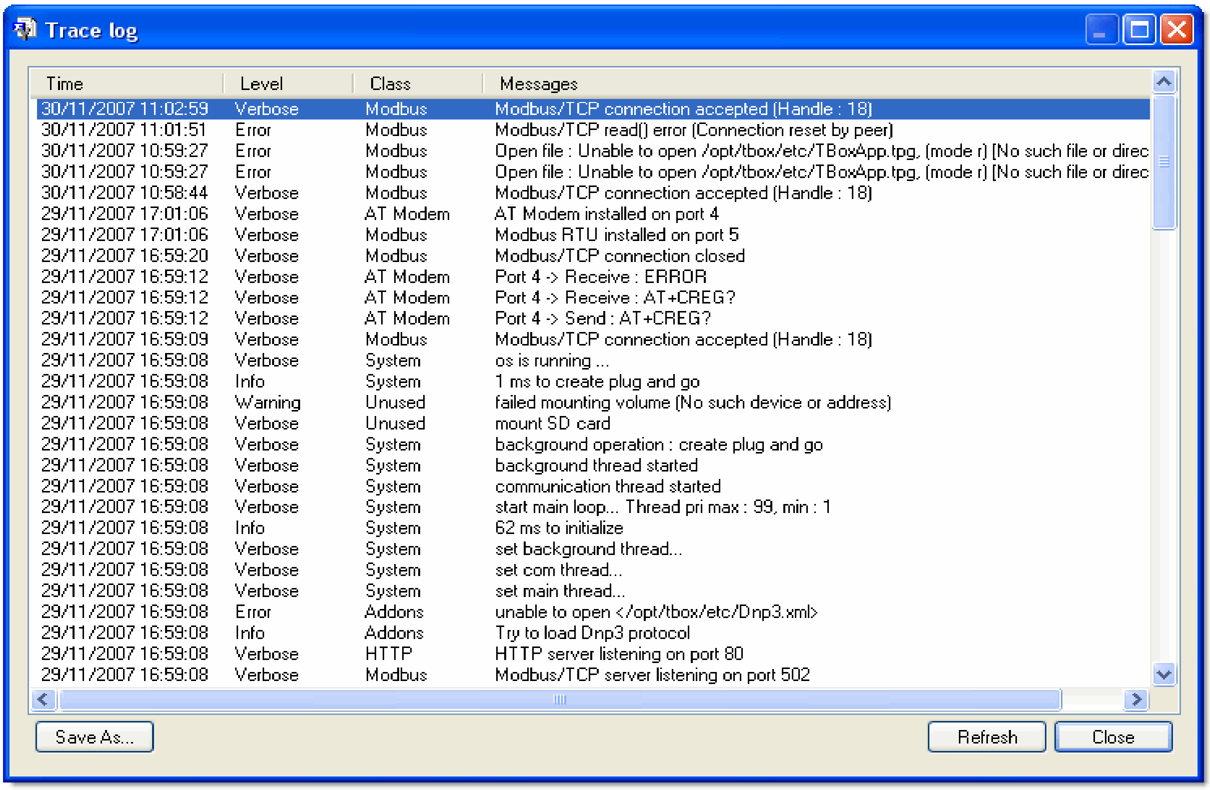
The Class allows you selecting the feature for which you want to display message (modem connection, sending e-mail, ...).
You can also select 'All' to display all classes.

Time Range

Type 'relative': You select a period from now (in minutes).
Example:: to display the last day, type 1440 minutes.

Type 'absolute': You select a specific period of time in the past.

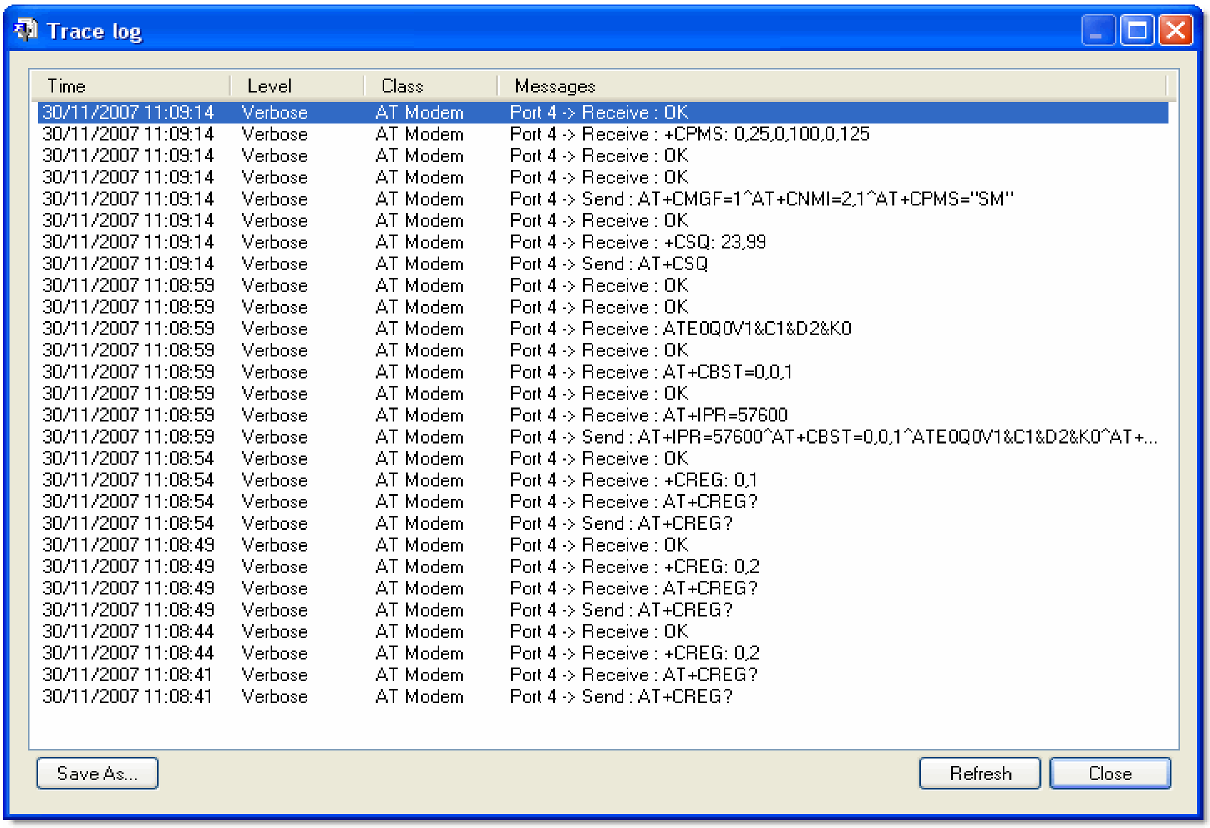
Example 1: with **all levels** and **all classes**



Time	Level	Class	Messages
30/11/2007 11:02:59	Verbose	Modbus	Modbus/TCP connection accepted (Handle : 18)
30/11/2007 11:01:51	Error	Modbus	Modbus/TCP read() error (Connection reset by peer)
30/11/2007 10:59:27	Error	Modbus	Open file : Unable to open /opt/tbox/etc/TBoxApp.tpg, (mode r) [No such file or direc
30/11/2007 10:59:27	Error	Modbus	Open file : Unable to open /opt/tbox/etc/TBoxApp.tpg, (mode r) [No such file or direc
30/11/2007 10:58:44	Verbose	Modbus	Modbus/TCP connection accepted (Handle : 18)
29/11/2007 17:01:06	Verbose	AT Modem	AT Modem installed on port 4
29/11/2007 17:01:06	Verbose	Modbus	Modbus RTU installed on port 5
29/11/2007 16:59:20	Verbose	Modbus	Modbus/TCP connection closed
29/11/2007 16:59:12	Verbose	AT Modem	Port 4 -> Receive : ERROR
29/11/2007 16:59:12	Verbose	AT Modem	Port 4 -> Receive : AT+CREG?
29/11/2007 16:59:12	Verbose	AT Modem	Port 4 -> Send : AT+CREG?
29/11/2007 16:59:09	Verbose	Modbus	Modbus/TCP connection accepted (Handle : 18)
29/11/2007 16:59:08	Verbose	System	os is running ...
29/11/2007 16:59:08	Info	System	1 ms to create plug and go
29/11/2007 16:59:08	Warning	Unused	failed mounting volume (No such device or address)
29/11/2007 16:59:08	Verbose	Unused	mount SD card
29/11/2007 16:59:08	Verbose	System	background operation : create plug and go
29/11/2007 16:59:08	Verbose	System	background thread started
29/11/2007 16:59:08	Verbose	System	communication thread started
29/11/2007 16:59:08	Verbose	System	start main loop... Thread pri max : 99, min : 1
29/11/2007 16:59:08	Info	System	62 ms to initialize
29/11/2007 16:59:08	Verbose	System	set background thread...
29/11/2007 16:59:08	Verbose	System	set com thread...
29/11/2007 16:59:08	Verbose	System	set main thread...
29/11/2007 16:59:08	Error	Addons	unable to open </opt/tbox/etc/Dnp3.xml>
29/11/2007 16:59:08	Info	Addons	Try to load Dnp3 protocol
29/11/2007 16:59:08	Verbose	HTTP	HTTP server listening on port 80
29/11/2007 16:59:08	Verbose	Modbus	Modbus/TCP server listening on port 502

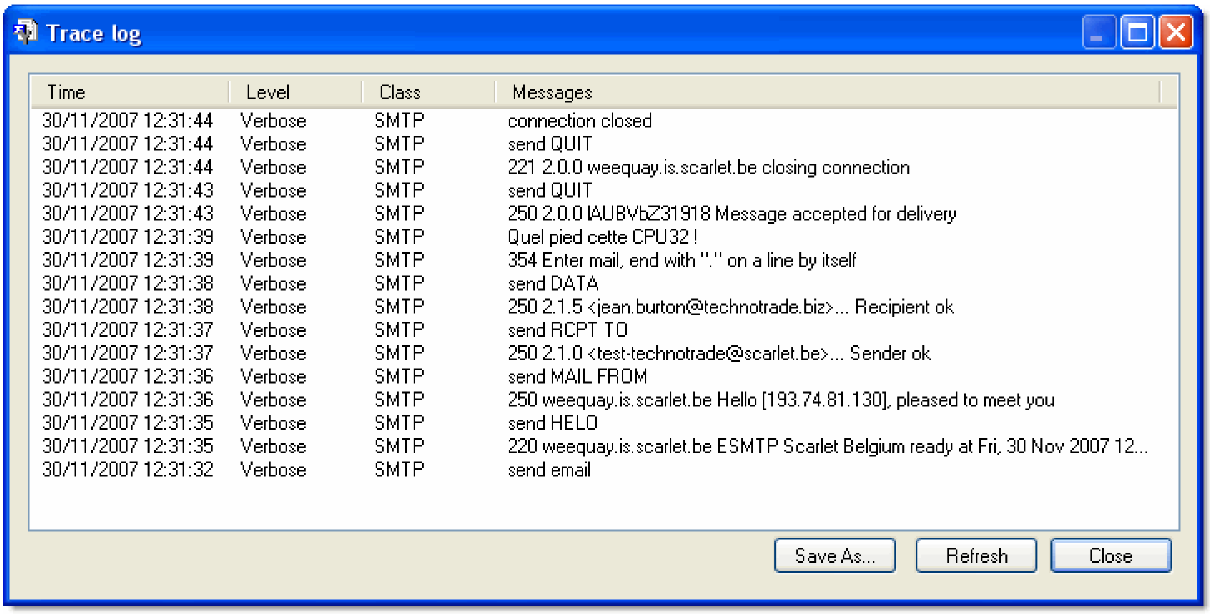
TBox MS32 can store **64 kbytes** of data for Trace Log. When this amount is reached, newer data replace older data.

Example 2: **modem connection**



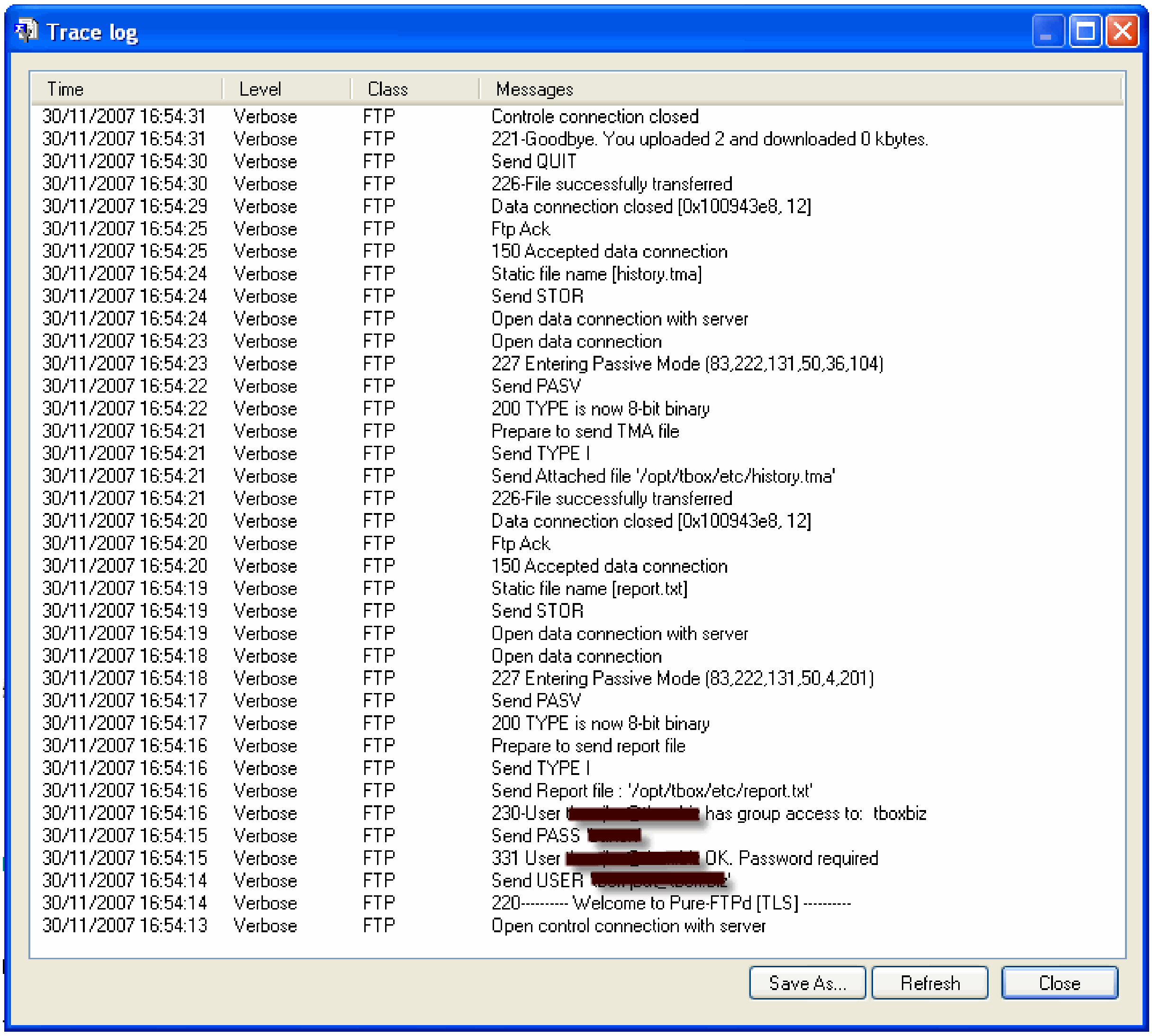
Time	Level	Class	Messages
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Receive : +CPMS: 0,25,0,100,0,125
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Send : AT+CMGF=1^AT+CNMI=2,1^AT+CPMS="SM"
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Receive : +CSQ: 23,99
30/11/2007 11:09:14	Verbose	AT Modem	Port 4 -> Send : AT+CSQ
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Receive : ATE0Q0V1&C1&D2&K0
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Receive : AT+CBST=0,0,1
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Receive : AT+IPR=57600
30/11/2007 11:08:59	Verbose	AT Modem	Port 4 -> Send : AT+IPR=57600^AT+CBST=0,0,1^ATE0Q0V1&C1&D2&K0^AT+...
30/11/2007 11:08:54	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:08:54	Verbose	AT Modem	Port 4 -> Receive : +CREG: 0,1
30/11/2007 11:08:54	Verbose	AT Modem	Port 4 -> Receive : AT+CREG?
30/11/2007 11:08:54	Verbose	AT Modem	Port 4 -> Send : AT+CREG?
30/11/2007 11:08:49	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:08:49	Verbose	AT Modem	Port 4 -> Receive : +CREG: 0,2
30/11/2007 11:08:49	Verbose	AT Modem	Port 4 -> Receive : AT+CREG?
30/11/2007 11:08:49	Verbose	AT Modem	Port 4 -> Send : AT+CREG?
30/11/2007 11:08:44	Verbose	AT Modem	Port 4 -> Receive : OK
30/11/2007 11:08:44	Verbose	AT Modem	Port 4 -> Receive : +CREG: 0,2
30/11/2007 11:08:41	Verbose	AT Modem	Port 4 -> Receive : AT+CREG?
30/11/2007 11:08:41	Verbose	AT Modem	Port 4 -> Send : AT+CREG?

Example 3: **SMTP connection**



```
Time                  Level      Class    Messages
30/11/2007 12:31:44   Verbose    SMTP     connection closed
30/11/2007 12:31:44   Verbose    SMTP     send QUIT
30/11/2007 12:31:44   Verbose    SMTP     221 2.0.0 weequay.is.scarlet.be closing connection
30/11/2007 12:31:43   Verbose    SMTP     send QUIT
30/11/2007 12:31:43   Verbose    SMTP     250 2.0.0 lAUBVbZ31918 Message accepted for delivery
30/11/2007 12:31:39   Verbose    SMTP     Quel pied cette CPU32 !
30/11/2007 12:31:39   Verbose    SMTP     354 Enter mail, end with "." on a line by itself
30/11/2007 12:31:38   Verbose    SMTP     send DATA
30/11/2007 12:31:38   Verbose    SMTP     250 2.1.5 <jean.burton@technotrade.biz>... Recipient ok
30/11/2007 12:31:37   Verbose    SMTP     send RCPT TO
30/11/2007 12:31:37   Verbose    SMTP     250 2.1.0 <test-technotrade@scarlet.be>... Sender ok
30/11/2007 12:31:36   Verbose    SMTP     send MAIL FROM
30/11/2007 12:31:36   Verbose    SMTP     250 weequay.is.scarlet.be Hello [193.74.81.130], pleased to meet you
30/11/2007 12:31:35   Verbose    SMTP     send HELO
30/11/2007 12:31:35   Verbose    SMTP     220 weequay.is.scarlet.be ESMTP Scarlet Belgium ready at Fri, 30 Nov 2007 12...
30/11/2007 12:31:32   Verbose    SMTP     send email
```

Example 4: **FTP connection**



```
Time                  Level      Class    Messages
30/11/2007 16:54:31   Verbose    FTP      Controle connection closed
30/11/2007 16:54:31   Verbose    FTP      221-Goodbye. You uploaded 2 and downloaded 0 kbytes.
30/11/2007 16:54:30   Verbose    FTP      Send QUIT
30/11/2007 16:54:30   Verbose    FTP      226-File successfully transferred
30/11/2007 16:54:29   Verbose    FTP      Data connection closed [0x100943e8, 12]
30/11/2007 16:54:25   Verbose    FTP      Ftp Ack
30/11/2007 16:54:25   Verbose    FTP      150 Accepted data connection
30/11/2007 16:54:24   Verbose    FTP      Static file name [history.tma]
30/11/2007 16:54:24   Verbose    FTP      Send STOR
30/11/2007 16:54:24   Verbose    FTP      Open data connection with server
30/11/2007 16:54:23   Verbose    FTP      Open data connection
30/11/2007 16:54:23   Verbose    FTP      227 Entering Passive Mode (83,222,131,50,36,104)
30/11/2007 16:54:22   Verbose    FTP      Send PASV
30/11/2007 16:54:22   Verbose    FTP      200 TYPE is now 8-bit binary
30/11/2007 16:54:21   Verbose    FTP      Prepare to send TMA file
30/11/2007 16:54:21   Verbose    FTP      Send TYPE I
30/11/2007 16:54:21   Verbose    FTP      Send Attached file '/opt/tbox/etc/history.tma'
30/11/2007 16:54:21   Verbose    FTP      226-File successfully transferred
30/11/2007 16:54:20   Verbose    FTP      Data connection closed [0x100943e8, 12]
30/11/2007 16:54:20   Verbose    FTP      Ftp Ack
30/11/2007 16:54:20   Verbose    FTP      150 Accepted data connection
30/11/2007 16:54:19   Verbose    FTP      Static file name [report.txt]
30/11/2007 16:54:19   Verbose    FTP      Send STOR
30/11/2007 16:54:19   Verbose    FTP      Open data connection with server
30/11/2007 16:54:18   Verbose    FTP      Open data connection
30/11/2007 16:54:18   Verbose    FTP      227 Entering Passive Mode (83,222,131,50,4,201)
30/11/2007 16:54:17   Verbose    FTP      Send PASV
30/11/2007 16:54:17   Verbose    FTP      200 TYPE is now 8-bit binary
30/11/2007 16:54:16   Verbose    FTP      Prepare to send report file
30/11/2007 16:54:16   Verbose    FTP      Send TYPE I
30/11/2007 16:54:16   Verbose    FTP      Send Report file : '/opt/tbox/etc/report.txt'
30/11/2007 16:54:16   Verbose    FTP      230-User [redacted] has group access to:  tboxbiz
30/11/2007 16:54:15   Verbose    FTP      Send PASS [redacted]
30/11/2007 16:54:15   Verbose    FTP      331 User [redacted] OK. Password required
30/11/2007 16:54:14   Verbose    FTP      Send USER [redacted]'
30/11/2007 16:54:14   Verbose    FTP      220---------- Welcome to Pure-FTPd [TLS] ----------
30/11/2007 16:54:13   Verbose    FTP      Open control connection with server
```

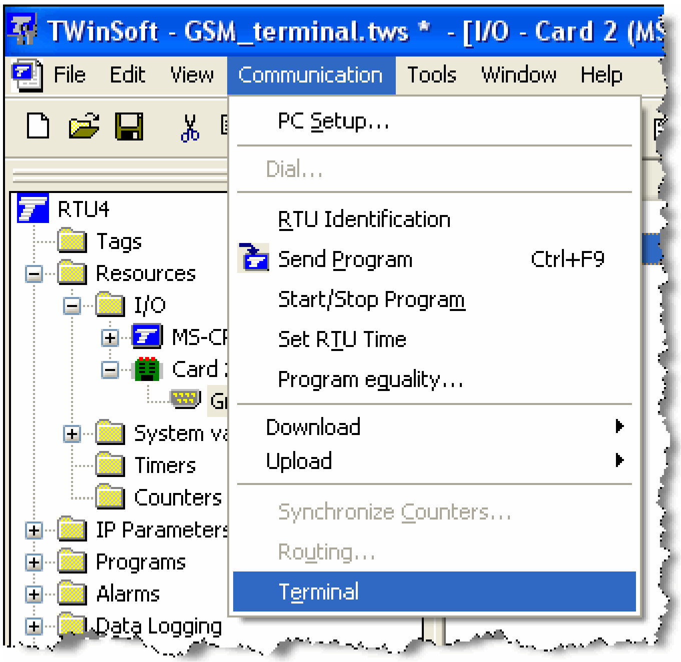
Appendix H. Terminal mode

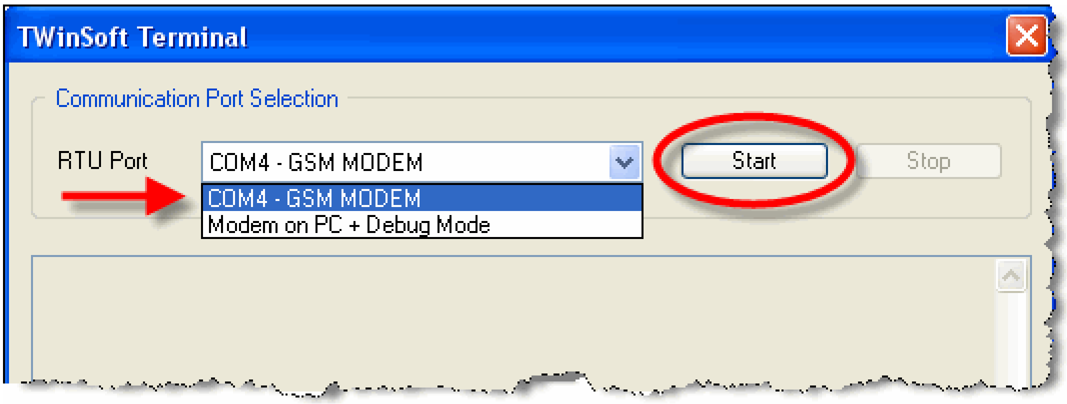
The 'Terminal' mode allows accessing a modem in 'AT command'.

Before starting :

1. The TWinSoft connection to the RTU **MUST be through RS232 at 57600 Bps** (corresponding to the internal Baudrate of the modem).
   It is not possible to use Terminal mode with Ethernet.
2. Working with MS-PSTN, MS-GSM, MS-GPS **you have to use the RS232 port of the card**; not the RS232 port of the CPU.
3. If working with MS-GPS, **be very careful**. Any command sent is automatically stored in flash.

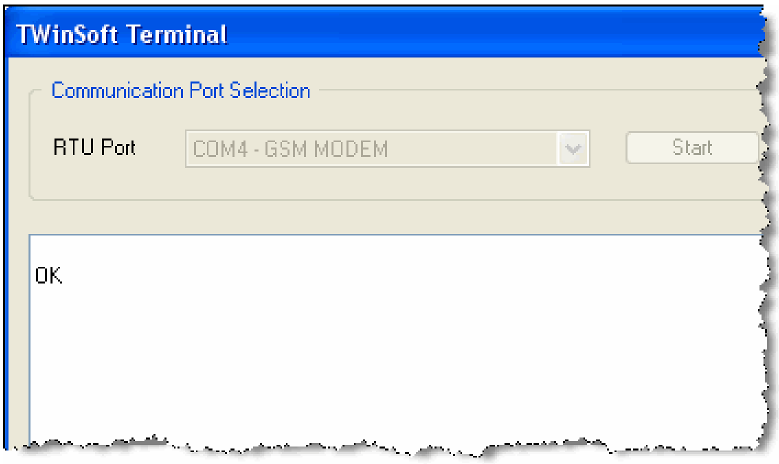
It is available from the menu 'Communication' → 'Terminal':





Example with MS-GSM

Examples of commands to check the availability of a GSM:



RTU Port: COM4 - GSM MODEM

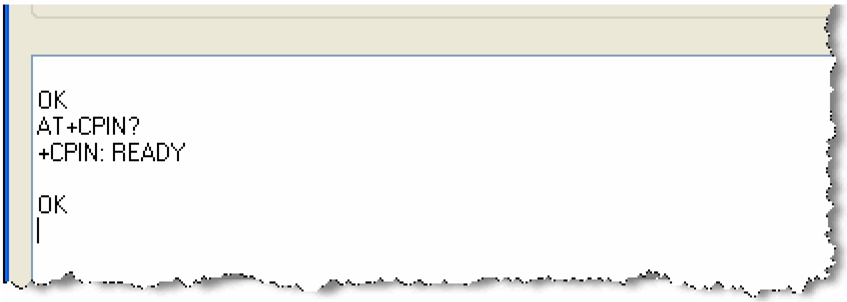
```
OK
```

To activate the echo in the window, type
ATE1 <ENTER>

(you don't see what you type, it is normal)

The modem answers with
OK

From now on you will see what you type

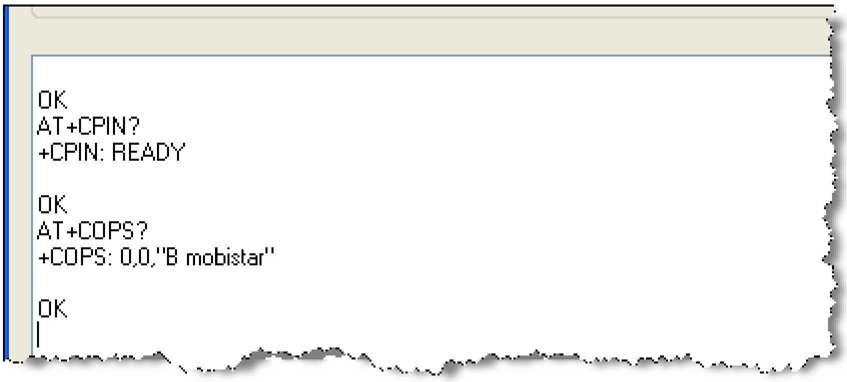


```
OK
AT+CPIN?
+CPIN: READY

OK
|
```

To check if the SIM card is ready, type
AT+CPIN? <ENTER>

The modem answers
CPIN: READY



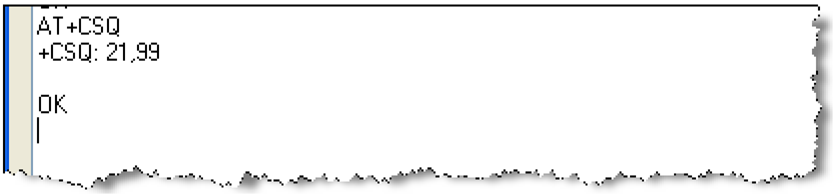
```
OK
AT+CPIN?
+CPIN: READY

OK
AT+COPS?
+COPS: 0,0,"B mobistar"

OK
|
```

To check the GSM operator has been found, type
AT+COPS? <ENTER>

The modem answers with a code or the name of the operator



```
AT+CSQ
+CSQ: 21,99

OK
|
```

To check the quality of the signal, type
AT+CSQ <ENTER>

The modem answers
+CSQ:xx,99

xx: must be between 20 and 31

To quit the Terminal mode, click the button "Stop"

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